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THE LOST VILLAGES OF MEDIEVAL ENGLAND
M. W. Beresford 129

THE SHIRA PLATEAU OF KILIMANJARO George Salt 150

THE CHARCOAL IRON INDUSTRY IN THE EARLY EIGHTEENTH CENTURY
B. L. C. Johnson 167

AN UNDESCRIBED MANUSCRIPT COPY OF INŌ CHŪKEI'S MAP OF JAPAN
Norman Pye and W. G. Beasley 178

AN EXPEDITION TO THE SIERRA DE LA MACARENA, COLOMBIA
W. R. Philipson, C. C. Doncaster and J. M. Idrobo 188

THE MOVEMENT OF POPULATION IN ENGLAND AND WALES IN 1851 AND 1861
C. T. Smith 200

RECENTLY DISCOVERED TRACES OF THE FRANKLIN EXPEDITION
R. J. Cyriax 211

A NEW APPROACH TO WORLD DISTRIBUTION MAPS
F. V. Botley 215

IRRIGATION IN THE INLAND NIGER DELTA OF THE FRENCH SUDAN
R. J. Harrison Church 218

WATERMARKS AND THE STUDY OF EARLY MAPS: Review
R. A. Skelton 221

A NEW PLAN FOR THE CITY OF CAMBRIDGE: Review
A. A. L. Caesar 223

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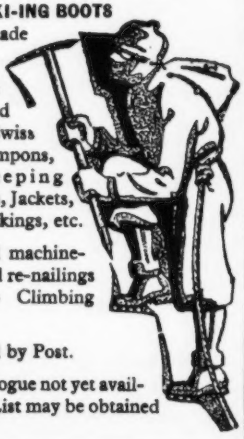

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THE LOST VILLAGES OF MEDIEVAL ENGLAND

M. W. BERESFORD

"I have taken all possible pains in my country excursions for these four or five years past to be certain of what I allege. Some of my friends think that the depopulation of villages does not exist, but I am myself satisfied."
OLIVER GOLDSMITH, Prefatory Letter to *The Deserted Village*.

THIS PAPER is concerned with those villages of medieval England which have failed to survive as centres of population. As flourishing as their neighbours in the twelfth and thirteenth centuries, they appear now only as a complex of earthworks in open countryside; some may have a farm-house or a manor-house near them which will bear the name of the village. Others lack even this memorial. Yet these abandoned sites have their place in economic history: for each represents a landowner pursuing his advantage to the point of destroying a farming community, either inside or outside the letter of the law. They have their place in the history of land-use also: for each was the victim of conversion from arable to pasture and from the open-field landscape to the enclosed sheep-run. In the study of settlement they indicate an appreciable number of villages which must be added to the Ordnance Map if we wish to see the settlement pattern of the mid-fourteenth century in its completeness. From then until the industrial revolution the number of nucleated units seems on balance to have decreased. In these sites we see the layout of the medieval village unencumbered by more recent acretions.

Many modern English villages, which are still very much alive as communities, show that the area they occupy is less than of earlier centuries, and the earthworks of former cottages and gardens flank the edges of the village. But the shrunken village is a separate study, and we are here concerned with the village site which has shrunk to a pair of cottages, a farm, or a field-lane.

The material on which I have drawn includes the list of 146 Lincolnshire sites made by the late Canon Foster [1] in 1924, the excavation of a Berkshire

[1] See C. W. Foster and T. Longley, 'Lincolnshire Domesday,' *Lincs. Rec. Soc.* 1924; Bruce-Mitford, *Oxoniensia*, 31 (1940); W. G. Hoskins, *Trans. Leics. Arch. Soc.* 22 (1948); M. W. Beresford, *Trans. Birm. and Midland Arch. Soc.* 60 (1950) and in *Yorks. Arch. Journal*, 37 (in the press). There is extensive German literature on *Wüstungen*. I have profited from the writing and company of Professor Mortensen of Göttingen.

site by Bruce-Mitford in 1940, the account of Leicestershire sites by Dr. W. G. Hoskins in 1944 and my own paper on the Warwickshire sites recently published. This paper has profited by the availability of air photographs for these and other counties, by the inspection of many sites and by the Yorkshire survey which I have just completed.

The evidence from air photographs

The first air photograph of an abandoned site was published as long ago as 1925 by O. G. S. Crawford,[1] but the full value of air photography was not apparent until the R.A.F. Print Library was made available to research workers after the war. The photograph of Wharram Percy in the East Riding [2] (Plate 1) shows even the internal walling of buildings and served as a guide in trial excavations in the summer of 1950 (Plate 3). Most sites lose only a little of their impressiveness when seen from the ground and, as in the air-photograph, the lines of the streets are unmistakable; some of them have been worn down two or three feet by the passage of carts, animals and men.

It is usually possible to locate the point where the furlongs of the open fields began and where the crofts of the cottagers ended, for a firm raised wall of earth or stones runs between, now smoothed and rounded a little by its covering of grass. Inside this boundary lies the croft or back-garden which the peasant cultivated individually and which formed no part of the open fields. The crofts are usually long and narrow, one end butting on the fields and the other at the cottage; and at Wharram Percy the cottages have an alignment along the brow of a steep valley side. But often the street plan is much less tidy. This dividing line between crofts and open fields appears in all the air photographs which I have studied and is sometimes the clearest detail of all. In some cases its outer edge is accentuated with a ditch and this has led to the descriptions of villages [3] as being protected by "ramparts." If the outer edge of the village was in fact so defended by a ring-fence we might expect to find signs that the perimeter had been expanded as the settlement grew, for the ring fence of the seventh century is unlikely to have fitted that of the fourteenth. It would also be interesting to find that crofts had crept out over open fields as villages expanded, or that house-sites had been abandoned as they contracted; but this evidence awaits discovery.

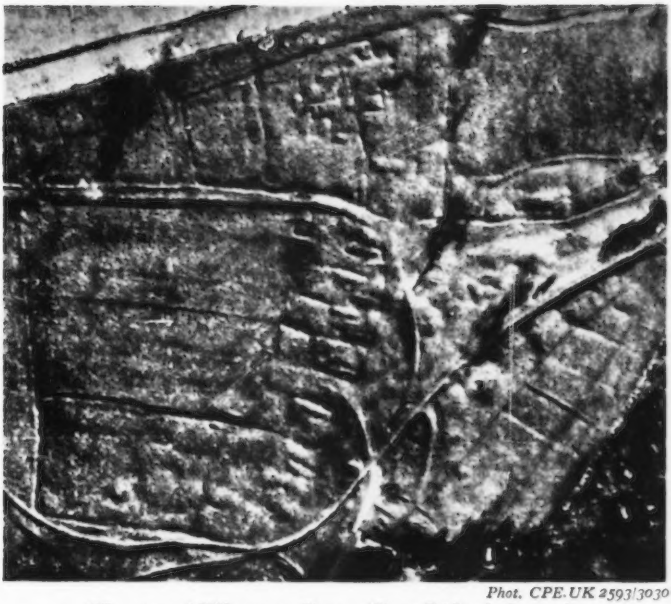
An abandoned cottage is represented on the ground by a shallow depression (its floors) surrounded by raised mounds (its walls) and often the shroud of grass and soil (usually from 9 to 12 inches deep) does not conceal the definite right-angled turns of the walls beneath. Partition walls are less visible before excavation; doorways are represented by gaps in the walls.

Fish-ponds are a medieval feature which time has done little to conceal; fed by a stream or supplemented by conduits, the chambers lie along a valley with their earthen dams almost intact. The floors of the ponds are usually smooth and, even where the ponds are now dry, bear their crop of marsh buttercups in season. These ponds have found their way on to many 6-inch

[1] O. G. S. Crawford, *Antiquaries Journal* (1925), 432.

[2] Photograph CPE.UK 2593/3030.

[3] H. A. Allcroft in 'Earthworks of England' (1908) knew of some deserted sites and has examples of "ramparts" around existing villages.



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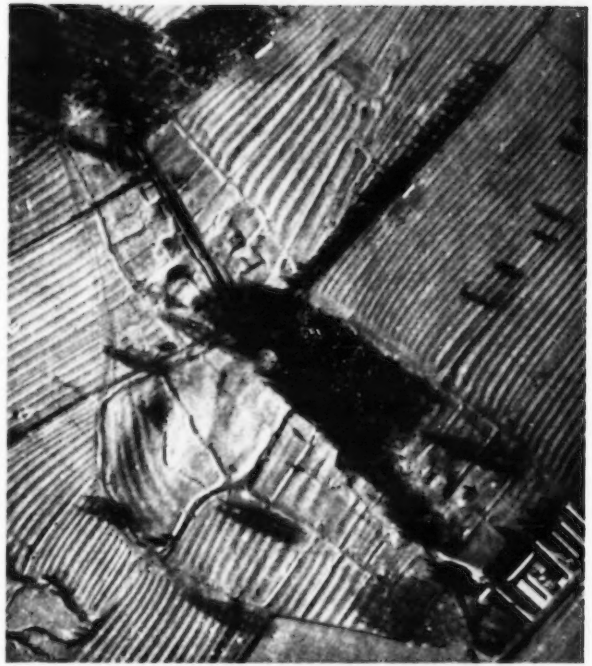
1. The site of Wharram Percy (East Riding) from the air

2. The first edition of the 6-inch Ordnance Survey

3. Excavation of manor house wall, Wharram Percy, 1950



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4. The site of Old Sunderlandswick (East Riding)

sheets of the Ordnance Survey, even when the village site has not, and they can be a useful pointer in tracking down the site of a former settlement.

The elucidation of individual detail from the village earthworks has inevitably to be based on excavation, and little of that has yet been done. A few sites, principally in Yorkshire, were carefully mapped by the first Ordnance Surveyors. The Wharram Percy plan appears as Plate 2. But surveys on the ground, aided by air photographs and followed by excavation, will be necessary before we can make definite statements like "that's the windmill" or "that's a kiln." For some villages there is the supplementary evidence of the "extents" accompanying *Inquisitions Post Mortem* which contain good topographical detail. For Wharram Percy we have a detailed "extent" of part of the manor [1] in the year 1369. It concerns an assignment of dower and the portion includes tenements with land in the open fields of the village. There is "le Prestehous" with a close and land, four other cottages, three waste tofts, a watermill, a common oven, a "kylne," a pond called Milndam on the north side of the town and another on the south side, common pasture, and the profits of the court in the manor house. Six messuages with their open field holdings are listed, as well as nine bovates of demesne land lying in the open fields.[2] The six bovates and nine bovates are described in common form; Reynold Martinson's, for example, "lying throughout the whole field next to the metes dividing the demesne strips from the lands of the tenants at will on the east side of the culture called *Medelgates* and so throughout the Field."

In the Wharram Percy photograph the complex of rooms and courts within the manor house stands out clearly from the simple village housesteads, just as the crofts stand out from the ridged open fields. But only the spade will find the kiln, and the pond on the north side probably lies for ever within the railway cutting which occupies the valley.

In a few villages, as at Wharram Percy, the church or chapel has remained. In others, as at Cestersover in Warwickshire, part of it was utilized for the barn wall of the depopulating landlord's manor house. Elsewhere the church, like the manor house, may have served as a quarry for years after the depopulation; a witness answering the Court of Exchequer [3] in 1615 deposes: "he knew Newton [Warwickshire] three score years since, and the chapel to be then standing, and that it was plucked down by the then inhabitants and the timberwork thereof also taken. There is a close called Chappell Close." At Stretton Baskerville in Warwickshire the church floor lies a foot or so beneath the grass and much of the faced stone is scattered in neighbouring fields; some has been gathered to make the walls of a sunken tennis court at Stretton House. As Sir Thomas More had observed, the sheep were now so fierce that they ate up men, or as the author of 'Pericles' [4] was to say, "such whales have I heard on i'the land who never leave off a-gaping until they've swallowed the whole parish; church, steeple, bells and all."

[1] *Cal. Inquis. Post Mortem*, Edward III, vol. xii, 183.

[2] Messuage is the portion of land occupied by the dwelling house. Bovate is the amount of land which one ox could plough in a year; it varied from 10 to 18 acres. Toft is the site of a house.

[3] Special Commissions, Exchequer 4683 (Public Record Office).

[4] 'Pericles,' act ii, sc. 1.

Contemporary sources

Contemporary comment on the destruction of villages is well known to historians. There is the Act of 1488 against depopulation in the Isle of Wight [1] and that of the next year, in more general terms, "agaynst pullyng doun of tounes," which links the destruction to the conversion of arable fields to pasture—"in somme Townes two hundred persones were occupied and lived by their lawfull labours (but) nowe ben there occupied two or three herdemen and the residue fallen in ydelness."

Similar figures are used by the capmaker in the anonymous 'Dialogue of the Commonweal;' [2] "where both corn and all sorts of cattle were reared now is there nothing but sheep. Instead of some hundred or 200 persons that had their living thereon now be but three or four shepherds and their master." In the same dialogue, set in Coventry of 1549, the husbandman says "I have known a dozen places within six miles hereabout where 40 persons had their living and now one man and his shepherd hath all."

In the 'Decaye of England only by the great multitude of shepe' written [3] between 1550 and 1553, other Midland counties are brought in: "there is not so many ploughs used . . . within Oxfordshire as was in King Henry the Seventh's time, and since his first coming in there lacketh 40 ploughs; every plough was able to keep six persons . . . and where that twelve score persons were wont to have meat drink raiment and wages now there is nothing kept but only sheep. Now these twelvescore persons had need to have living: whither shall they go? into Northamptonshire? and there also the living of twelvescore persons lost: whither shall then they go? forth from shire to shire and to be scattered thus . . . and for lack of masters driven, some of them to beg, and some to steal."

Half a century later Cecil remarks [4] "If we debar tillage we give scope to the depopulator; and then if the poor being thrust out of their houses go to dwell with others straight we catch them with the Statute of Inmates; and if they wander abroad they are within danger of the Statute of the Poor to be whipped." A common phrase of the 1517 Government inquiry is that the dispossessed went away "tearfully" and "into idleness."

The returns to the Inquiries of 1517 and 1548, and the counties which are named in the Statute of 39 Elizabeth c. ii (". . . for the Maintenance of Tillage and Husbandry"), seem to indicate that the problem was most acute in the Midlands, Pembrokeshire, the chalk-country of the south-west (including the Isle of Wight) and, beyond the Trent, in parts of Yorkshire, Durham and Northumberland. A well-known map [5] of the more accessible "enclosure" cases confirms this distribution, although it must be remembered that not all "enclosures" indicate complete depopulation and a deserted village.

Warwickshire is fortunate in having in John Rous a fifteenth-century

[1] 4 Henry vii, c. 19.

[2] ed. E. Lamond (1893), pp. 15, 48 and lii.

[3] Four Supplications, 1529–33, *Early Eng. Text. Soc.* (1871), p. 93.

[4] Quoted in Bland, Brown and Tawney, 'Select documents,' (1914), p. 275.

[5] By E. F. Gay, most easily accessible in J. B. Black, 'The reign of Elizabeth' (1936), p. 449.

chantry priest [1] who felt strongly against enclosure. In a long digression in his 'History of the Kings of England' the depopulators are likened to William of Normandy in their savage harrying of the countryside. Unlike many pamphleteers, he adduced evidence in the form of a long list of depopulated villages which he had seen emptied in his own life-time, and for some of them he compares the population "now" with that of the Hundred Rolls of 1279. A few of his villages have been re-settled, but the main substance of his indictment stands.

After the sixteenth century the deserted village did not receive a great deal of attention. Local histories were concerned more with genealogy, and where, as in Dugdale or Thoroton, the abandoned village is mentioned the subject has failed to hold the attention of succeeding local historians. Travellers like De La Pryme [2] may have visited such sites much as they visited Roman sites, or like Stukeley they may have confused a deserted village with a Roman camp, but at least they did not, like some early volumes of the *Victoria County Histories*, ignore them.

No commentator seems certain which desertion Goldsmith was describing in 'The Deserted Village,' although Ireland is usually suggested. By an odd coincidence Auburn is the name of a lost East Riding site, but I do not know whether Goldsmith ever came there. It is not in fact necessary to link his poem with a Tudor depopulation, for there was a good deal of talk in his own day of the effect of Parliamentary enclosures, commercialized agriculture and absentee landlords, together with the moralist's praise for the simple country virtues. Goldsmith's poem may be no more than an imaginative fantasy on these themes.

After the law-making, the prosecutions and the denunciations in pamphlet and sermon, the deserted villages remained. Bishop Latimer, preaching before Edward VI, complained that although there were many good laws they had lacked enforcement. There was in fact a distinct falling off of depopulation in the sixteenth century, whether from the fear of the Statute after 1489; or of prosecution in 1517, 1548 and between 1597 and 1598; or of the successful petition of the evicted villagers to the Court of Star Chamber or the Court of Requests. It may have been that all the villages which could be easily and profitably converted to sheep-runs had been converted. In Warwickshire 72 sites were abandoned between 1450 and 1485, but only 21 between 1485 and 1600. The author of the 'Discourse' was probably more correct than his editor allowed when he said in his account of Warwickshire depopulation "the greater part of the destruction of towns was before the reign of King Harry the seventh."

Farther north it is possible that the peak was reached a little later.

Even with this accumulation of contemporary evidence modern historians have been sceptical about the extent of the destruction of villages. So acute an observer of the face of the countryside as the late Sir John Clapham says,[3] "deserted villages are singularly rare in England." In his 'Agrarian Problem'

[1] John Rous, '*Historia Regum Angliae*.' Brit. Mus. Ms. Cot. Vesp. A. xii.

[2] *Surtees Soc.*, vol. 54.

[3] Sir J. H. Clapham, 'Concise economic history of Britain' (1950), p. 197 (modified by his editor in the note on p. 80).

R. H. Tawney was unduly cautious, while E. F. Gay [1] spoke of "hysterical and rhetorical complaint condemned by its very exaggeration." Faced with a contemporary list of over forty abandoned sites in Warwickshire, Lipson, rather than see if the places appeared on an Ordnance map, took refuge in the suggestion that they were an eighteenth-century forgery.

The Tudor pamphleteers have only themselves to blame. They cried "Wolf" so often. They linked the depopulation of villages to their erroneous guess that the total population of England was falling. In the later sixteenth century they spoke of "depopulation" when they were describing enclosure for rational arable farming, which did not destroy a village although it might reduce the labour force employed in its economy. As far as I know, they failed to name one depopulated village in any of their printed comments. But although this should induce caution in handling Tudor evidence it does not warrant disbelief; fortunately we have the sites themselves and a quantity of documentary evidence.

The method of inquiry

The counsel of perfection would be to examine every air photograph of every field in an area, and then to follow up suspicious earthworks in documentary sources to see if a village had existed. In fact even this immense task would not be entirely satisfactory, since the existing air photographs do not give a picture of every field in the country under the necessary conditions of season, crop growth, height of aeroplane, angle of photograph or position of the sun.

Another course would be a tour of every field on foot. This might fill some gaps left by the air photographs, but it has its limitations for the observer whose eyes are only body-height above the soil or crop. Fortunately there are short cuts which enable a large number of fields to be eliminated and which should place the site within a manageable area for foot or air-reconnaissance. A prima facie case can be established, and confirmed or rejected by field-work and documentary investigation.

A parish with an isolated church standing in green fields is at once suspicious if it is in a countryside of nucleated villages. Such are Church Charwelton in Northamptonshire and South Cowton in the North Riding. Similar suspicion is aroused by finding a parish with a name which cannot be linked to any existing settlement in the parish area. On occasion there are linked parish names, like Lillings Ambo in the North Riding or Westrill and Starmore in Leicestershire, where one or both partners have disappeared. More often a parish name is that of a single farm (perhaps at the heart of a web of footpaths), which may be the manor house of the depopulator or its modern successor. Such is Wilstrop Hall in the deserted parish of Wilstrop in the West Riding. Shortly after the enclosure, rioters from neighbouring villages, including some distinguished Yorkshire gentry and the Abbot of Fountains, gathered around this house, broke down the fences of the park and threatened to kill the depopulator.[2] They failed: nor were they able to rebuild the village which is now a bumpy pasture on the banks of the Nidd.

[1] E. F. Gay, *Quarterly Journal of Economics*, 17 (1903) 594.
[2] Star Chamber proceedings Henry VII, no. 58 (P.R.O.).

In villageless parishes the search for the site may be aided by a local tradition, sometimes twisted by generations of verbal transmission. At Stretton Baskerville neighbouring villagers will tell you that Henry VII on his way to Bosworth Field called for help which the squire refused. On his victorious return Henry Tudor burned the village. Unfortunately for a good story we have the record of the inquiry of 1517 which describes how, on the 6 December 1494, the enclosing sheep master [1] drove away eighty people "sorrowfully to idleness." There may be stories of buried gold; bells heard mysteriously at night in a buried church; the removal of the church to open country by a whim of the devil; haunted fields; or, more prosaically, there may be the name Town Field, Township Field, Down Field or Downslip Field, still in uncomprehending use. At Gainsthorpe the tradition was that the village harboured notorious thieves on whom the exasperated neighbours took a destructive vengeance.

The modern 6-inch sheets may also offer a clue. The fifteenth and sixteenth century enclosures produced fields which were often bigger in size (as well as less geometrical) than those which resulted from later enclosure, whether by agreement or by Act of Parliament. Where these have not been broken up into smaller divisions in recent times they can be striking; such is the case at Whatborough and Bittesby in Leicestershire, or at Creslow in Bucks.

Documentary sources

From prima facie evidence one turns to documentary sources for further information; or they may themselves provide a prima facie case; for example, a vill in Domesday Book which is now only a farm warrants investigation. Nearer to the fifteenth century are the taxation lists which were gathered under village headings. These 'Lay Subsidies' [2] will, after 1334, assign the same quota of taxation to a village year in year out; but the assessments are useful in establishing that a community of some taxable capacity was still in existence in 1334. When we find the now grassy houses of East Tanfield in the North Riding assessed at 28*s*. and its neighbours (happily still with us) at 20*s*, 26*s*, 23*s*, 20*s* and 26*s*, we may reasonably conclude that East Tanfield had not then been depopulated. If lists from some of the earlier Subsidies (such as that of 1327) have survived they will give details of persons and goods.

The Poll Tax returns at the end of the reign of Edward III and in the first years of Richard II similarly enable us to establish the existence of a village at the end of the fourteenth century. For some villages there are long lists of names of villagers; for most others there are the Poll Tax receipts which specify "received the sum of . . . . for . . . . heads" at fourpence the head.

These poll tax returns and receipts dispel the persistent suggestion of depopulation by the Black Death. The force of the pestilence was certainly severe and there were settlements which were never resettled as communities, but such a fate must have been quite exceptional. In the vast majority of cases the Poll Tax return for a deserted village shows a substantial population

[1] I. S. Leadam, 'Domesday of inclosures' (1897), p. 431.

[2] The subsidies will be found in E.179 at the P.R.O. The poll tax records are in the same class.

thirty years after, in 1379. Here a phrase of John Rous is apt, for in his denunciation of the depopulating landlord he uses the analogy of the plague and speaks of "pestis avaritiae," the plague of money grubbing.

In a somewhat similar way one may use, with caution, the tax rebates which were granted to villages in the later middle ages. We must also allow that there were other causes which might destroy a village, and examples [1] can be found. It might be fire, a common accident, or the Scots or the French. It might be a mass exodus to a drier, higher, or more fertile site. But these interesting examples are few in number compared with the number of depopulations between *c.* 1470 and 1550. Indeed, if we were to complete a list of the medieval depopulators, we should go back to the destruction by William the Conqueror; to the devastation of Stephen's reign; and to the depopulation of their estates by the new Cistercian landlords in the twelfth and thirteenth centuries. But again we have comparatively small numbers, and there is no danger of confusion with the Tudor depopulations since the older destruction will mean the absence of the village from the tax lists and from the standard feudal documents.

It is interesting, too, to compare the "lost" villages with their neighbours at a time before the depopulating movement was underway. A convenient point is 1334, for in that year a new tax quota was negotiated which was to serve as a norm for more than a century and "may serve the economic historian as a very fair index of the prosperity of sections of the nation at that time." [2] The assessment was in effect a local judgment on the relative capacity of villages to contribute to the county total. In the table opposite some lost villages in Yorkshire are compared with their immediate neighbours, and they do not seem to have been less prosperous at this time than their neighbours.

The year 1334 was well before the Black Death; later tax assessments were conventionalized and it is not possible to base much of an argument on their valuations. The re-assessment of 1446 may have done something to adjust the conventional assessment, but a better guide to conditions after the Black Death will be found in the poll tax returns, particularly those of 1377. Again, it would be difficult to pick out from the records of 1377 the villages which were destined to survive. The poll tax figures support the argument that the Black Death was not the immediate cause of the depopulated village for, twenty-eight years after the plague, they were villages which seem as healthy as their neighbours. They were certainly not empty.

Similar calculations have been made for groups of East Riding villages, and the conclusions are the same. Depopulation struck indifferently at large villages and small; at villages with a high tax capacity and at villages with a low; at villages which had been badly hit by the Black Death and at villages where the population after the plague was well up to the local average.

[1] For fire see *Victoria County Histories*, 'Bedfordshire' ii, 84; for the Scots, the North Riding volume; and for the French at Excete, the Sussex volume. An example of a village which has moved is Gardham (formerly Newton) in the East Riding.

[2] H. C. Johnson and J. F. Willard, 'Surrey taxation returns' (1932), Introduction (B).

Some lost villages in Yorkshire compared with their neighbours

	Tax quota of 1334	*Revision 1446*	*Poll Tax Payers* 1377	1381
North Riding:				
319763 Norton Conyers ..	25*s*	21*s*	49	—
	26	*20*	*20*	—
339886 Swainby	18*s*	15*s* 4*d*	29	—
	28	*23s 1d*	*80*	—
354891 Solberge	8*s*	6*s*	33	—
	13	*11*	*40*	—
410966 Winton	24*s*	—	25	—
	16		*34*	—
160870 Danby-on-Ure ..	30*s*	—	38	—
	28s 6d		*18*	—
423852 North Kilvington ..	30*s*	25*s* 6*d*	39	—
	36	*31s 1d*	*42*	—
363897 North Otterington ..	16*s* 8*d*	14*s*	51	—
	22	*16s 11d*	*33*	
West Riding:				
483552 Wilstrop	17*s*	—	—	25
	21			
532442 Steeton	24*s*	—	—	42
	12			
607960 Stancil	22*s*	—	—	87
	19			
450360 Lotherton	22*s* 10*d*	—	—	46
	31			
East Riding:				
054432 Eske	—	—	63	—
			98	
857643 Wharram Percy ..	—	—	40	—
			51	
970650 Cowlam	—	—	54	—
			112	
993557 Eastburn	—	—	69	—
			69	

Note. The grid reference precedes the name of the site. The figures in italics are the averages for neighbouring villages.

In Warwickshire a number of poll tax lists survive for the tax of 1381. This tax aroused much apparent evasion, but we may assume that the coefficient of evasion was the same in those villages destined to be lost and those destined to survive. The average number of taxpayers in the 11 "to-be-lost" villages which appear on the surviving rolls, is 20. The average for the 44 other villages in the rolls is 43, and only one is as low as 20. Of the 11 lost villages the smallest had 10 taxpayers, one had 34 and another 30. If this is a representative sample, the depopulating landlords of Warwickshire were most

successful in the villages which were already smaller than the average. But here again the victims were not depopulated by the Black Death. A study of the 1334 tax quotas for Warwickshire villages, together with the 1436 and 1442 revisions, seems to point to the same conclusion: the to-be-lost villages receive no undue share of the relief allocated,[1] ". . . in partum relaxacionis et exoneracionis pauperum villarum Civitatum et Burgorum desolatorum vastatorum vel destructorum." Caution is necessary because in the applications for tax exemption exaggerated language is common and no petition was complete without expressions such as "decay," "desolate," "impoverished," "empty of people." And there is always the possibility that the exemption obtained may have been the result of bribery or successful political pressure.

Such rebates fall into two main groups: that immediately after the Black Death, when the fines levied on those who broke the wage-freeze were applied to the relief of badly hit villages, and that in the fifteenth century, when the conventional assessments of 1334 were found too heavy. In 1433 £4000 was allowed in relief from the national total of £37,000 and in 1446 a further £2000 was allowed. The tax returns describe the relief as being distributed among villages according to needs. In the Rydale wapentake of the North Riding £47 9*s* 8*d* was normally due. The sum of £8 6*s* 9*d* was allowed in relief in 1449 (roughly 18 per cent.). Appleton le Street obtained 33 per cent., New Malton 25 per cent. and the majority of villages just under 18 per cent. But New Malton and Appleton le Street are not deserted villages and the wapentake includes villages, now deserted, whose relief was only average.

Indeed almost any record may accidentally reveal what we want to know. It may be a lawsuit which enables us to say "the village is still here," or a survey which enables us to say "now it has gone." It is not always possible to find rentals or court rolls of the period between the Black Death and Tudor enclosure: the desertion of the village would mean that the manor court would cease to meet, and there would be no need to preserve the rolls. Indeed, if the depopulation had been brought about by illegal eviction, the lord of the manor might have had good reason to destroy the evidence that there had ever been a flourishing community there. If rolls do survive they will furnish evidence whether the villagers peacefully allowed the lands to fall into the lord's hands, or whether the enclosure was an act of sudden aggression.

Even when, as in most cases, there is no such continuous series of court records, a single roll, rental, or extent will usually show whether the village was alive or dead at a particular date. One such is East Tanfield in the North Riding, a depopulation which occurred between 1513 and 1517, when 32 people were evicted and 400 acres enclosed. Ministers' accounts[2] for this manor exist for 22/3 Henry VI in the form appropriate for a flourishing village. Any document before 1500 which deals with landed property is worth attention. It may be a charter in a monastic cartulary dealing with tofts, crofts, open-field land or other signs of village life, or a deed conveying houses, or a detailed feudal "extent" of a manor, its tenants and its arable fields.

[1] H. C. Johnson and J. F. Willard, 'Surrey taxation returns' (1932) p. 171 (quoting E179/184/86).

[2] S.C.6/1087/11 (P.R.O.).

In the sixteenth century the destruction of the village may have involved direct litigation; either a suit by the dispossessed villagers or a prosecution by the Crown. For the Inquisitions of 1517, we have documents printed by Leadam, and supplementary litigation. In the State Papers later in the century there are other specific inquiries into depopulating landlords.

One or two examples may be given of sites which were confirmed or located by documentary evidence. Stretton Baskerville was investigated because of the very full description of the evictions given before the Commission of 1517; Wilstrop because of the blunt allegation made by the parson of Kirk Hammerton in his Star Chamber suit against Guy Wilstrop in 1514 [1] ". . . in defraud his father Miles Wilstrop and he did cast down the town of Wilstrop, destroyed the corn fields and made pastures of them and hath closed in the common and made a park of it."

Trial excavations at the site of Wilstrop revealed a quantity of medieval pottery and we are able to describe a good deal of the building in this village, for the Wilstrop family had their deeds and charters copied into a book [2] which now rests in the John Rylands Library at Manchester. One deed concerns 28 tofts and 26 adjacent crofts: so that there were at least 26 dwelling units. In 1336 there was a fulling-mill *"quod vocatur Walkmylne,"* and in the Poll Tax list of 1379 two of the 25 persons taxed were fullers.

The records of Chancery and Exchequer in the years after the Inquiries of 1517 and 1548 have been used by L. A. Parker [3] for Leicestershire. In the Patent Rolls will be found pardons obtained (for cash) by those who enclosed and depopulated contrary to the Statutes. Hogshaw in Buckinghamshire [4] has a ruined church to mark its site, and the pardon is in the Patent Roll of 4 Edward VI. In other cases there are informations laid against enclosers in the Courts of Star Chamber and in the Court of Requests. At Ascot in Great Milton (Oxon) the villagers complain that the defendants have threatened to turn the town to pasture. In the early Chancery Proceedings are petitions from evicted tenants and petitions from convicted landlords like that of Sir Nicholas Vaux. ". . . to have the benefit of the King's pardon . . . for decaying houses and conversion of arable into pasture in Stanton [Bucks] as found by inquisition for which he is ready to pay such price as the Court orders."

Of the government Inquiries, the fullest printed returns are those of 1517–18 and 1549, printed in I. S. Leadam's 'Domesday of Inclosures' and there are others still in manuscript. The survival of one membrane of the papers in a suit before the ecclesiastical Court at York in the early seventeenth century [5] tells us that "the towne or village of Eastbourne of the parish of Kirkburn did aunciently consist of a great many messuages cottages and dwelling houses and that the lands or grounds belonging to the same was very inconsiderable and consisted most of tofts crofts garths and others backsides

[1] Star Chamber proceedings, Henry VIII, bundle xvii, 131. (P.R.O.).

[2] Latin MSS. 251.

[3] L. A. Parker in an unpublished thesis (Ph.D. University of London) on "Leicestershire enclosure, 1485–1607."

[4] Hogshaw: Cal. Patent Roll Edward VI, ii, p. 193; Ascott: Court of Requests, 2/8/256; Stanton: Early Chancery Proceedings 452/37.

[5] Diocesan Records, R.As.26.

belonging to the said houses." Eastburn is one of those villages marked on the 1-inch map as "ancient village" (grid reference: 44/993557); it was a Domesday vill and we know that in 1304 the manor had forty and a half bovates worked by villeins in bondage and two worked by a freeman. In 1401 the lady of the manor possessed it all except the two free tenements.

An abandoned village might create difficult legal questions in later centuries for, unless it became extra-parochial, it remained part of some ecclesiastical parish and its pastures were liable for tithe and for parish rates. Without a church and churchwardens there was no unit for collection, even had the sheep-master been a willing contributor. But the very fact of the depopulation usually left him the sole landowner, in no frame of mind to relieve the poor of a non-existent village or maintain the incumbent of a non-existent church.

It was such a tithe controversy which settled for me the site of the village of Kiplingcotes. In a tithe suit the memory of the oldest inhabitants of the district was drawn upon by the court and they deposed [1] that "divers ancient people say and affirm that in old time there was a town called Kiplingcotes within the parish of Middleton (on the Wolds). The said town of Middleton in those times and in sundry deeds and writings appears by the name of Middleton cum Kiplingcotes. There was a chapel, and the lesser of the two bells in Middleton church were brought thither when the town was demolished. (They had) often seen the plain marks and indications of divers frontsteads and foundations of divers houses and also a large hole where there was a well for the use of the inhabitants of Kiplingcotes. . . . The said Town Field of Kiplingcotes has become part and parcel of the common of Middleton." The site of Kiplingcotes is indicated in another tithe suit of 1689 when a witness deposes [2] that the "tract of land called Kipling coates and shortlands is notoriously scite and situate within the parish of Middleton," and he refers to customs of a date "before the said towne was demolished and the said Townefeild of Kipling coates are become part and parcel of the common of Middleton." The site lies near Kipling House (Grid reference: 44/900479) but the name is better known in the North for the grassy uplands which have been for some centuries the site of the Kiplingcotes Derby.

Down in Buckinghamshire the incumbent of Lillingstone Darrell described why he had no glebe [3] in 1625. "Bie the reporte of men of fower score yere olde there have beene twelve ploughs goinge and some six score inhabitings untill afterward and that aboute som 9 score yeres since . . . Thomas Darrell Esquier the first of five generations bought out the freeholders inclosed the Lordship pulled downe the towne turninge the same into fish pondes and also pulled downe the parsonage house and it doth credentlie appeare bie divers foundations of walles. It was an easie matter for a gredie Lordship to swallow up a little glebe." If this chronology is correct it would place the enclosure somewhere around 1445, which is rather early although not impossibly so.

Tithe administration of a later period produced the fine set of field-by-field

[1] Diocesan Records, R.VII.H. 4203.
[2] *Ibid.*, R.VII.H. 4202/5.
[3] Glebe terrier 1625, Lincoln Diocesan Records.

parish maps which accompanied the Tithe Awards of the mid-nineteenth century. The schedule bound with the map will in most cases record such field name; and where the village survives only as a field name this source is useful for locating the name, or for seeing whether there are any "Town Fields."

Another controversy, this time over an institution, led me to the site of Argam. In 1632 witnesses reported on the technique of instituting the incumbent to a non-existent church.[1] ". . . by cutting up a sod or piece of earth in the place where the church of Argam is supposed to have stood and delivering the same. The place where the parish church stood being now quite demolished and upon view of the same place it did appear to have been anciently a wall, and lest that the induction should be mistaken Mr. Gibson did cut up a sod or piece of earth upon either side of the place where the wall stood and another in the midst thereof." And one of the witnesses had "seen part of the walls of the church of Argam standing in his time . . . and there was only remaining a cottage where a shepherd and his wife lived."

Maps

If the lands of a village were a single property, the delineation of property boundaries, the main impetus to Elizabethan surveying, was superfluous. For this reason a contemporary map or survey of a deserted village site is of unique value. Without it, there are only the air photograph and the spade. I know of only one survey and two maps which delineate an abandoned village. The survey, a verbal one, is that of Sheriff Hutton, now in the British Museum.[2] In 1625 the Crown was selling much of the Forest of Galtres, including the demesne estate of Sheriff Hutton; a survey was made in connection with the sale and when the surveyor came to the southern bounds of Sheriff Hutton park the jurors told him that "East Lilling it is called and retaineth the name of East Lilling township though at this day there do remain but only one house. But by tradition and by apparent ancient buildings and ways for horse and cart visibly discerned leading unto the place where the town stood within Sheriff Hutton park, it hath been a hamlet of some capacity, though now utterly demolished . . . how long since doth not appear."

The site appears on the 1-inch map as "moats"; the moats are in fact lanes and the air photograph shows them leaving the village and running through the fields to Sheriff Hutton village. The parish name is Lillings Ambo—Lillings Both—and West Lilling survives as a village today. This site covers an extensive area and much pottery was recovered from the sides of the two ponds. At the time of the poll tax of 1379 31 persons paid tax. The individual detail of earthworks is confused and difficult to interpret and the quantity of depressions and mounds is embarrassing. No good air photograph has yet appeared to assist the interpretation.

Other sources of information include the first edition of the 6-inch map, which was careful to mark the boundaries and names of townships as well as parishes and has thus preserved the names of a number of medieval settlements. Equally useful are the County surveys of the English Place Name

[1] Diocesan Records, York, R.VII.H. 1885 and 1921.

[2] Harleian MS. 6288.

Society which often indicate against a minor farm name a suspiciously long set of documentary references, sometimes going back to Domesday. The older county historians vary in the attention which they give to lost villages, but this class of book can never be ignored. Dugdale is better than most because he had seen Rous' manuscript, Thoroton tucks away Nottinghamshire villages in a forest of family trees and Bridges is good for Northamptonshire. The *Victoria County History* is often disappointing, particularly in the volumes published before 1925; the histories of some parishes fail to mention the depopulation of the village, although some attention to depopulation (mainly through Leadam's influence) may appear in the sections on 'Social and Economic History.'

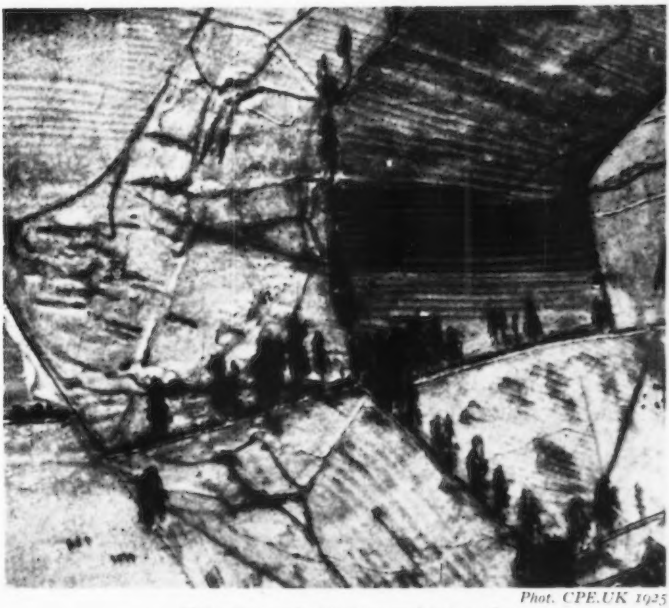
Very few sites have as yet found their way on to the Ordnance Map. None of the Warwickshire sites are marked, although one Leicestershire site, "the town of Hamilton," is named in correct Elizabethan phraseology. The Ordnance surveys of the Ridings of Yorkshire mark some of the sites as "ancient village." The Archaeological Officer of the Survey informs me that the war-time loss of records makes it impossible to discover the source used when these sites were first included. They go back to the earliest editions, and they gave rise to the identifications in the footnotes to the 'Nomina Villarum' which was edited by R. H. Skaife for the Surtees Society in 1867.

The contemporary map which included a deserted village site is that of Whatborough in Leicestershire, surveyed for All Souls, Oxford [1] in 1586 (Plate 6). It has been redrawn by R. H. Tawney in his 'Agrarian Problem' (1912), but it does not seem that he used it to find his way to the site; there are distortions in areas and mistakes in the copying of figures and names. This site is on a plateau which is almost the highest point in Leicestershire and has been subject to the smoothing and erosion of wind and rain for over four hundred years, although all but one corner has escaped the plough (Plate 5).

Another contemporary map which portrays the lay-out of a non-existent village street and cottages is that of Wotton Underwood, Bucks.[2] This is rather different from most villages considered here, in that it is an early example of the removal of the village from motives of landscape gardening. The manor house of the Grevilles lies over part of the village; another part lies under the ornamental lake; and still more is buried in the parkland (Plate 7). A few model cottages and a farm seem to have been built on another part, but the church still remains. Such replanning was more common in the eighteenth century. Harewood, Milton Abbas and Wimpole are often quoted, although other famous country houses conceal depopulated villages of the earlier period when the park created out of the medieval fields was at once useful for its deer and sheep, and ornamental to eyes which looked out from the windows of the great house over a view undisturbed by the intrusion of village houses. Such are Burton Constable in the East Riding, and Compton Winyates and Compton Verney in Warwickshire. But even the work of a landscape gardener of the Capability Brown school cannot wholly conceal the traces of the villages from the eye of the air camera.

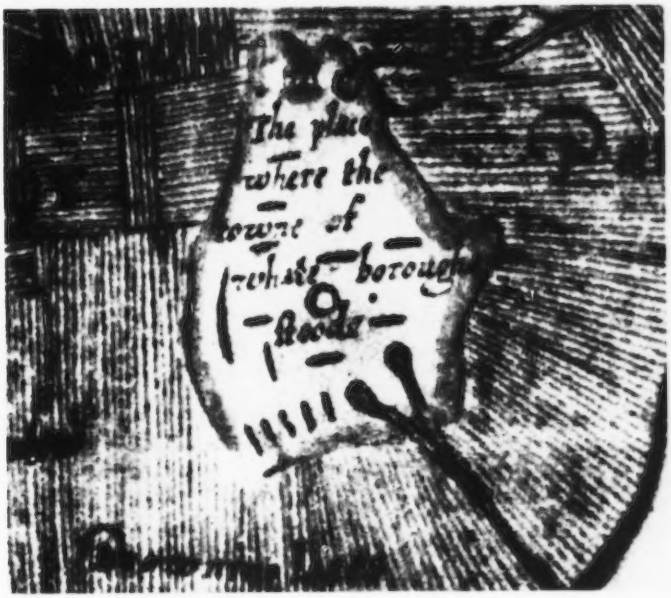
[1] The map is kept among the College muniments.

[2] The map is in the Museum at Aylesbury.

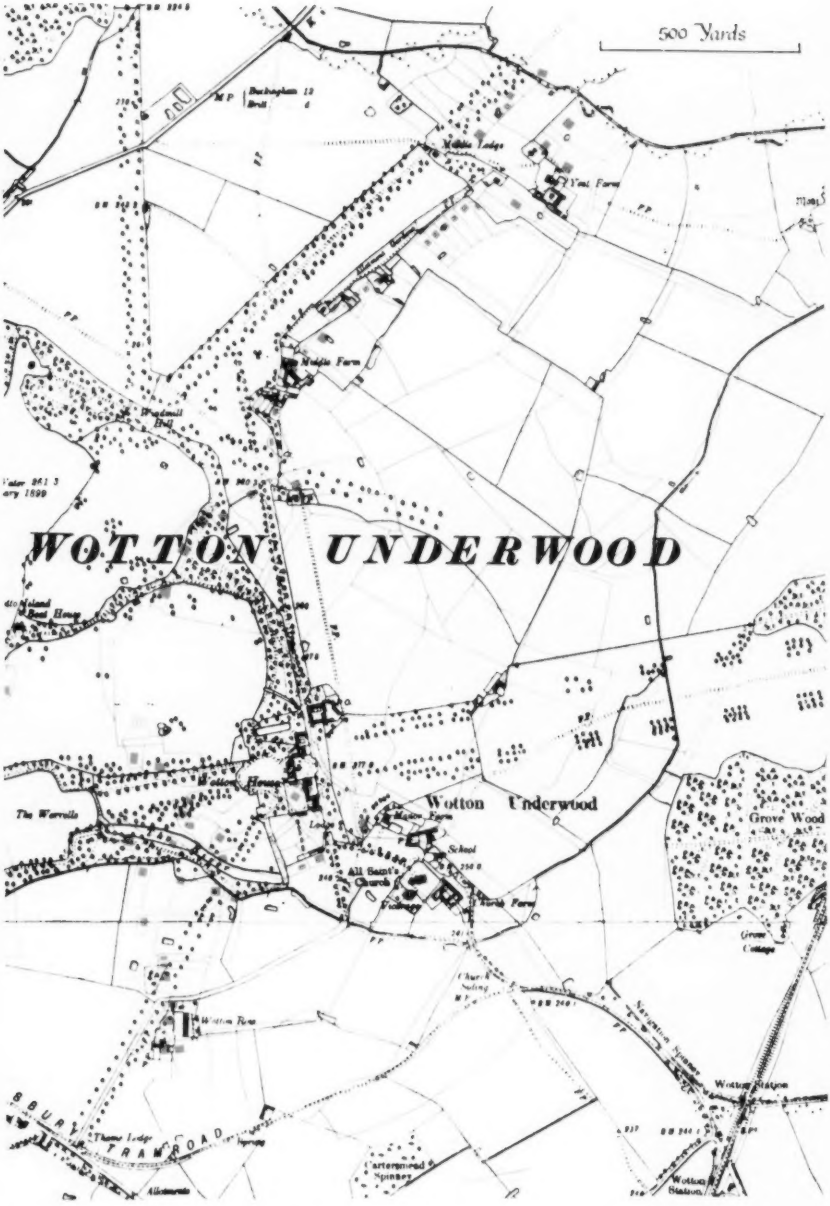


Phot. CPE.UK 1925

5. Whatborough (Leicestershire) today



6. The site of Whatborough in 1586, from the All Souls map



7. Wotton Underwood (Buckinghamshire). The survey of 1649 superimposed on the modern map

Social and economic causes of depopulation

It is now time to relate these abandoned villages to the advance and retreat of settlement. It has been shown that we can place the majority of the depopulations between about 1470 and 1550, with a distinct weakening of intensity after about 1520 although the Statutes and Inquiries continued into the seventeenth century. Indeed, at the end of the sixteenth century depopulation had come to mean a shrinking rather than an emptied village; much of the enclosure which the word was then being used to condemn was enclosure not for sheep but for more rational arable farming. This may have reduced the "hospitality" of a village (as the phrase went) but would not leave it a set of grassy mounds and ditches.

Our account of depopulation must be cast then in terms of the economic situation in the second half of the fifteenth and the beginning of the sixteenth centuries. This is a period whose economic history is but little known. One Ford's lecturer [1] saw its central theme as one of promise prejudiced. Professor Postan [2] sees the paradox of losses in general productivity but gains in social distribution. Over all hangs the confusion of a long civil war and the complexities of sources poorly calendared and little worked over.

We may accept at once the contemporary diagnosis that land was going over to sheep and that this was a deliberate choice of the landlords; villagers were not needed. That the evicted disliked eviction needs no elaboration, but all abandoned settlements need not imply forcible depopulation. Was there any throwing up of holdings voluntarily? Were there leases which landlords could find no one to take up? Were there freeholders willing to be bought out by the lord and customary tenants anxious to take to the roads? Contemporaries obviously believed that they were living in an age of contracting settlement and there is no reason why we should not accept their belief at its face value.

In the conditions of the fifteenth century, with a land surplus and a labour shortage, the strong bargaining power lay with the tenants. Unfavourable land fell back to nature, whether it was infertile or burdened with a heavy rent or an irksome customary service. The shortage of labour made attractive any mode of farming with fewer hands and the demand for wool seems to have been steady [3] if not soaring. To get an income by growing corn or by renting arable was to deal in a commodity where buyers were less forthcoming. An alternative to making the best of a bad job and being a rentier was to be a grazier, and there were men below the social rank of lord of the manor who also had a good eye to the main chance and who were there to take up the offer whenever they heard of a lord who was selling out his demesne.

[1] C. L. Kingsford, 'Prejudice and promise' (1910), M. Postan, "The fifteenth century" in *Econ. Hist. Rev.* 9 (1939) 160.

[2] M. Postan, "Some economic evidence of declining population in the later Middle Ages," *Econ. Hist. Rev.*, 2nd ser., 2 (1950) 221.

[3] Without better price statistics than we yet have, statements about the demand for wool in the fifteenth century are unreliable. For a much more cautious view see Sir J. H. Clapham, *op. cit.*, p. 198. My argument does not rest on an assumed increased demand from wool-buyers but on a steady demand, a responsive supply, fairly steady prices, and on profitability compared with alternate land-uses.

We may see the one type in the Grenvilles [1] who were buying up and consolidating strips between 1350 and 1493 in Wotton Underwood, as heartily as any would-be encloser in the eighteenth century. The type of the other can be seen in the peasants who came in to lease the closes which the Abbot of Eynsham [2] had cut out of his newly consolidated demesne when his villeins had gone. In such cases there is no law suit, no talk of eviction and no legal record in the central sources. Perhaps we obtain an exaggerated idea of the proportion of violent eviction by having to rely on litigation and petitions of the evicted for so much of our information. Even in them there is some evidence that the complaint sometimes concerns only a final depopulation in a long process of enclosure; those who could be bought out had been bought out already and the remaining recalcitrants were evicted.

One effect of the conversion of so much land to grass was an increasing specialization in the rural economy. A good deal of land which was potentially first-rate pasture had been condemned in the medieval economy to be ploughed so long as the corn market was weakly organized and uncertain. Not to do so invited starvation at the next bad harvest. This is the criticism levied by a speaker [3] in the Commons debate of 1597. ". . . and thus did the former lawmakers overslip tyeing the land once tilled to a perpetual bondage and servitude or being ever tilled." But tillage would only seem "servitude" to men who were confident that money made in sheep, cattle or textiles could buy them their corn in lean years.

In the mid-fifteenth century three forces moved in the same direction; the pressure of the population on the land seemed to be eased, the internal corn market was becoming more certain, so that specialization could be considered with some confidence, and there was a steady demand for wool which might be grown if a manor could be turned over to sheep, a change which we have already seen advantageous in terms of labour costs and alternative use.

The areas where depopulation took place are rather clearly marked; it was a force which acted widely but by no means everywhere. Bedfordshire and Cambridgeshire seem to have suffered much less than Northamptonshire, and Warwickshire more than Staffordshire, where land still best suited to corn did not change. There was also land which had always been quasi-pastoral and much farmed in severalty and this did not change in the same spectacular manner. But the Wolds of England tumbled to grass.

A map of Warwickshire depopulations shows that the main losses were in the champion country in the Avon valley and south of it on the Cotswold fringes. In the north of the county, in Arden, we are in an area whose settlement was biassed away from open-field communities, with a soil less suited to sheep-runs, and the map is relatively bare of deserted sites.

The early stimulus to the conversion therefore lies deeper than the wilful greed of a few leading landlords with Renaissance views on self-interest. It lies rather in economic activity, bargaining power and in the opportunity of utilizing a basic fact of British geography—the Grassy Shires. The marginal

[1] F. M. Powicke, "Observations on the English freeholder," in 'Dopsch Festschrift,' Leipzig (1938), p. 382.

[2] *Eynsham Cartulary* (*Ox. Hist. Rec. Soc.*), p. xlvii.

[3] Quoted in Bland, Brown and Tawney, *op. cit.*, p. 272.

concept has long been applied to the retreat of colonization in the fifteenth century and it is well known that marginal lands came out of cultivation as demand fell. To come out of cultivation meant to come out of the traditional open-field routines, and often (as we have seen) to come into one man's ownership.

But the lands which were discharged from the open field system as the margin moved and passed them by were marginal to corn; to grass they were often optimum. By a series of accidents grass land was available as it had never been for perhaps three centuries. In those three centuries the demand for wool had multiplied and now an alternative use was waiting. If this view is correct, then what happens next is that the opportunity of conversion, offered by accident (or by the economic system) to a few, is seen to be desirable by the many. Those who can, buy up; those who cannot, turn to thoughts of eviction.

At this juncture the disorder of the Wars of the Roses gave men unrivalled opportunities to do what they liked with their own, whether inside the law, outside the law, or on its margin. There were no specific anti-enclosure statutes and the evicted man would find a powerful landlord able to bar his access to a court. At the end of the wars the Tudors attempted to create order when the conversion was in full swing. They enacted statutes and used the prerogative courts to give some protection to the evicted. No doubt a large part of the slowing down of depopulating enclosure after 1520 was due to this administrative action, backed, it would seem, by a remarkably unanimous public opinion. When the Midland rioters [1] of 1607 said that they had heard of 340 townships destroyed and depopulated it was true, but few had been depopulated within their life-times. It was a memory that lingered and the word was useful in the attack on contemporary enclosing.

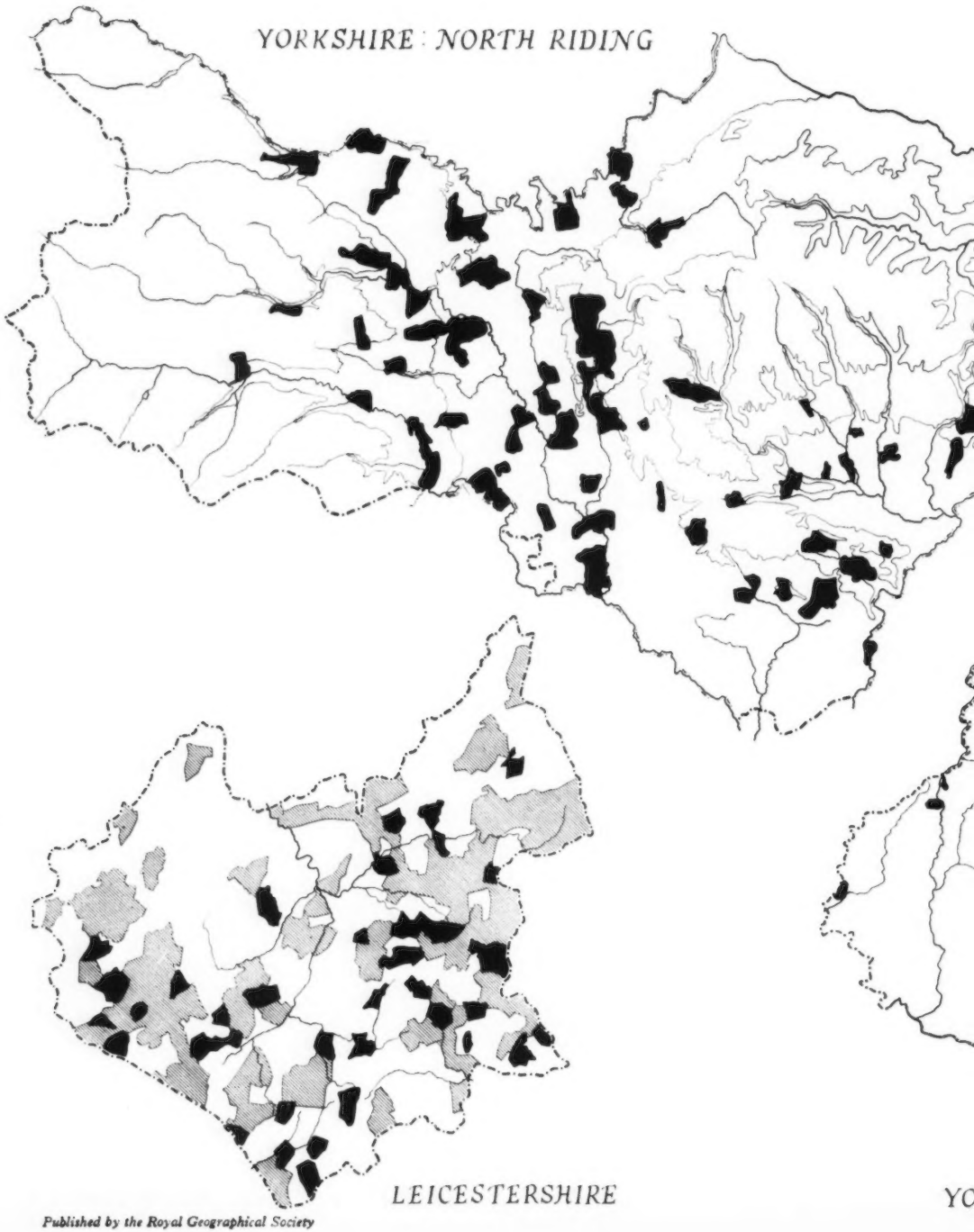
But when we have given credit to governors and publicists we must also allow something to economic forces. The movement of the margin and the trend to specialization had set the process in motion, but there was a point at which the optimum balance was being reached. To make England a landscape of sheep-runs would have been as bad as to leave it a landscape of open fields. It would have diminished efficiency (and probably profit) as much as it alarmed the recruiting sergeant in every Tudor monarch. It meant "decay of artillery" for "Whosoever doth not maintain the plough destroys this Kingdom." [2]

The balance may have been reached somewhere in the 1530's. And this was the time when the return of a pressure of population was beginning to make it clear that there was again something to be said (in profit terms) for corn, so that the landlord who had only just become an encloser may have found it profitable to enclose for more efficient corn-growing.

This fits some of the contemporary statements which have puzzled historians. The Author of the 'Discourse,' an acute Midland observer, said ". . . the great decay of husbandry was before the reign of King Harry the seventh," that is before 1485. To a historian who began with the Act of

[1] 'Petition of poor Delvers and Daylabourers of Warwickshire' (*c.* 1607), quoted in E. F. Gay, *Trans. Roy. Hist. Soc.* 18 (1905) 195.

[2] The dictum is that of Cecil in 1601 (Bland, Brown and Tawney, *op. cit.*, p. 274).



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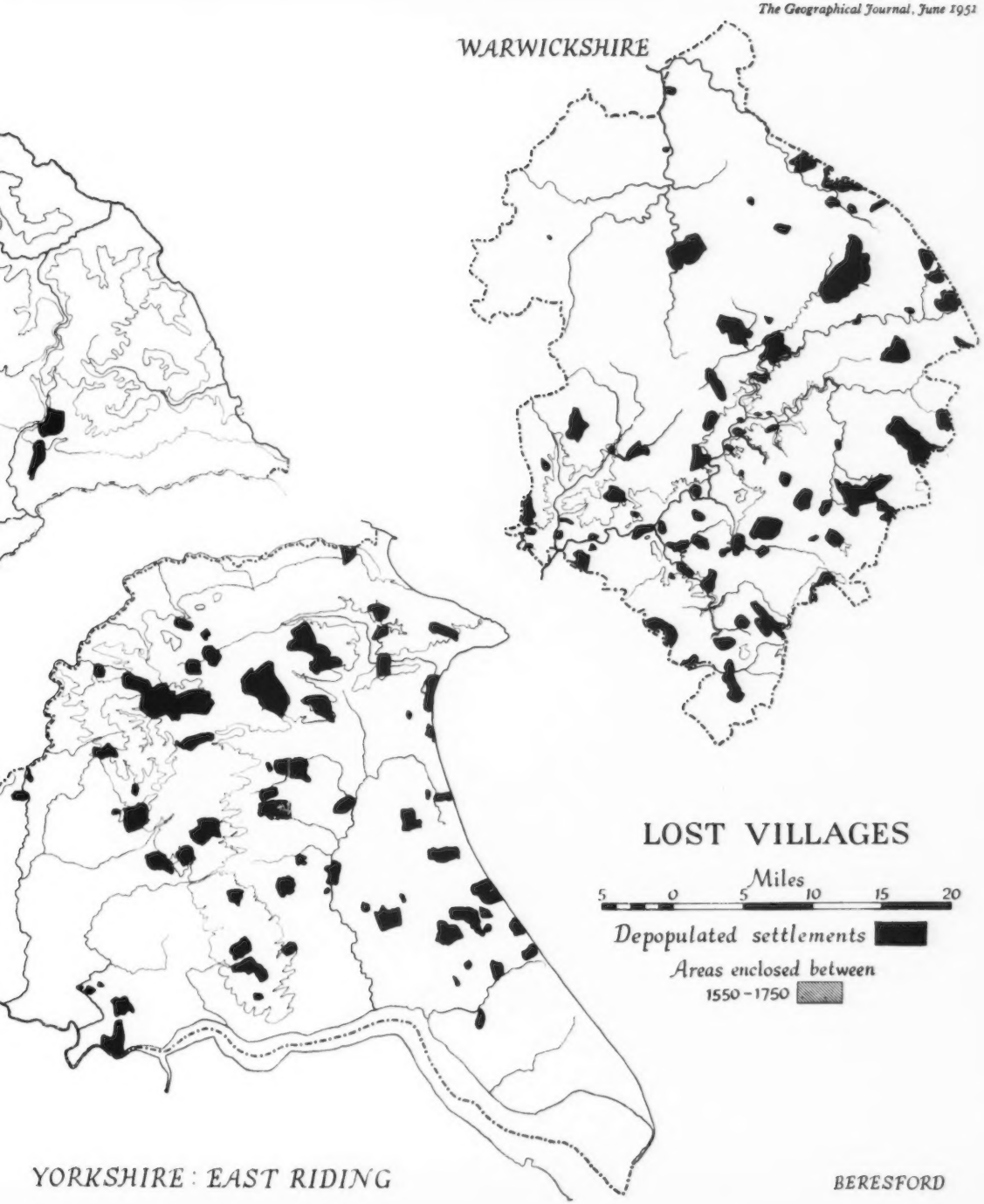

WARWICKSHIRE
LOST VILLAGES
Miles
5 0 5 10 15 20
Depopulated settlements
Areas enclosed between
1550 - 1750
YORKSHIRE : EAST RIDING
BERESFORD

1488 and who had his eyes on the 'Domesday of Inclosures' of 1517–18, this was hard to believe; but even the 'Domesday of Inclosures' includes a substantial proportion of enclosures which are not depopulation in the strict sense; and the 'Discourse' statement is backed by the independent statistical evidence of John Rous who listed his 61 Warwickshire villages lost before 1491. My own time-table of Warwickshire depopulation puts 72 settlements as lost before 1485, compared with 18 between 1485 and 1558 and 11 subsequently. Of the 15 Leicestershire villages for which he is able to give dates, Dr. Hoskins has 11 lost before 1509 and 4 more before 1549. Six of them were lost by 1500.[1]

The folding sheet of maps facing this page may be regarded as showing that, even within a county, both violent and peaceful enclosure (and for both sheep and corn) came first in certain districts. The map of Leicestershire on this sheet shows both the areas depopulated and those which were enclosed (legally or illegally) before the age and fashion of Parliamentary enclosure. Without a much closer knowledge of the personalities involved it is difficult to interpret. It may reflect the spread of the idea that enclosure pays, whether for arable farming or for grass; on the other hand it may mark the areas physically most suited to grass or least suited to corn, so that when the opportunity came the conversion was made.

The most extensive study of the personnel of the depopulators is that of Dr. W. G. Hoskins.[2] As he describes the lost villages, the names of county families recur, "Villers, Faunts and Turpins all knew each other and went hawking together. All were enclosers, and so were the Brooksbys and the Purefoys who were also friends and confidants of the Villers. The country gentlemen of Leicestershire, a small county in which everybody of social position knew everybody else, were not slow to learn from each other the new way of doubling their incomes by turning their estates into sheep pastures and driving away their tenants from the one-time arable farms."

Not all these families were as old-established as the Villers, who had lived in the village of Brooksby (now depopulated) since the time of Edward III. Many of their names occur in the lists of assignees of monastic lands after the Dissolution; some, like the depopulators of Cestersover or Stretton Baskerville, were London merchants; some depopulation was carried out in the late fifteenth and early sixteenth century by monastic landlords, as Leicester Abbey depopulated Ingarsby in 1469. Old families and the new rich stand side by side in the Inquiry of 1517–18 and probably Eileen Power was too sweeping when she said[3] "whoever was enclosing in the last part of the fifteenth century, it was not the old landlords."

Conclusion

In terms of the distribution of the rural population this movement meant a retreat from a number of sites, some with a history of settlement as old as any in England. Others of these sites had arisen in the outward push of colonization

[1] Warwickshire details from Beresford, *loc. cit.*; Leicestershire from Hoskins, *loc. cit.*

[2] Hoskins, *loc. cit.*

[3] 'Medieval English wool trade' (1941), p. 40.

in the twelfth and thirteenth centuries; the high-water mark of medieval settlement [1] lay further into some marginal land than even the ploughing-up campaign of 1940–44. A map of settlement in the early fourteenth century would include most modern villages *plus* many of the sites whose fate we have been describing. But in lonely places, like the ridge and furrow of medieval ploughing in Northumberland or Durham, there are the visible signs of how far the high-water mark of ploughing once stretched. They show perhaps how much there was in the complaints of those who petitioned for the Statute of Merton in 1234 to prescribe a limit (however small) to the advance of the plough into the pasture.

There were forests, heaths and marshes untouched by the plough in medieval times but colonized subsequently. This later colonization of the sixteenth, seventeenth and eighteenth centuries was not a return to the sheep-runs; these were left to their productive and profitable alternative use in grass. It turned to the open fields of the villages, seeking to use them more economically by enclosure, and to the still plentiful areas of forest, heath and fen. In general this new war against the natural landscape was conducted from old bases, and (the fens apart) there are not many records of new village communities arising. The expanding rural population had fewer centres of habitation than in 1300. More villages probably existed about 1320 than at any time before the industrial revolution. To plot the living villages and the lost villages on the same map is to discover how far there has been a retreat of village settlement.

DISCUSSION

Evening Meeting, 2nd April 1950

Before the paper, the PRESIDENT (Sir HARRY LINDSAY) said: Mr. Beresford, who is a lecturer at Leeds University, is going to talk to us this evening on lost medieval villages. He has developed a technique of search for the medieval villages by the comparison of photographs taken from the air with the medieval records. In addition to the slides which he is going to show you at the end of his talk, there are photographs and maps in the Ambulatory which you may see when the lecture is over.

Mr. Beresford then read his paper

The PRESIDENT: We have heard a most interesting lecture this evening, and I think you will agree with me that the choice of maps and illustrations has supported all that our lecturer has told us.

Professor H. C. DARBY: I am glad to have the opportunity of congratulating Mr. Beresford upon his very interesting and valuable paper. He is an economic historian and I think that fact in itself shows the great interest of the historical element in geography; it is as important as that of the geographical element in history. Sir John Clapham, an economic historian with a geographical leaning, said that he who is not a tolerable geographer is a very imperfect economic historian and that he could not picture a useful historical geographer who had

[1] "The lay-riggs as they are called still show decisively that in days long gone by, the ploughman and the sower have been there (in Tynedale) . . . houses became ruins and the very sites of villages were ploughed up." James Raine, 'The Black Book of Hexham.' (*Surtees Soc.*, 1865), p. xviii.

not got a fair working knowledge of economic history. I think from Mr. Beresford's account to-night we can claim him, to put it mildly, as "a tolerable geographer."

My own interest in deserted villages arose from an interest in the Domesday Book, for many Domesday places are not to be found on a modern map. There is a very interesting decayed or deserted village in the south-west of Cambridgeshire, Clopton, not far from the Great North Road. The Domesday shows it as a prosperous village with the usual complement of plough teams and population, but successive medieval assessments tell the story of a declining prosperity until, in 1561, only two houses and an empty rectory were left. In that year it was united with the village of Croydon, forming today Clopton-cum-Croydon.

When Foster produced his edition of the Lincolnshire Domesday in 1924 he found, he tells us, a surprising number of these lost and forgotten places and attributed them mainly to what he called the great pestilence of the fourteenth century. I think Foster's work, with the identification of over fifty lost places, was a remarkable pioneering effort; in a sense we were not ready for it in 1924. Since then Hoskin's work, and now Mr. Beresford's, has greatly extended the range and interest of the whole subject. For the historian it throws light on difficult and vexed questions, and for the archaeologist it opens up an exciting vista. For geographers of course it completes one chapter in the story of the development of English landscape and, for that if nothing more, I would like to thank Mr. Beresford very much indeed for what I feel has been a most fascinating account of the subject.

Professor W. G. EAST: Mr. Beresford is a bold man to come here and challenge Sir John Clapham and Professor Tawney on matters of economic history, but I think you will agree that he has thrown an extremely clear light on a very obscure chapter of history. He has reduced the problem to concrete, localized facts and the work on which he has embarked will go on, for I do not imagine he has given us to-night more than one aspect of it.

As I listened I wondered what a geographer could do that he himself had not done. It occurred to me that a geographer would examine very carefully to see whether any regional or physical considerations were relevant to the matter; he would be concerned in studying the changing soil pattern and drainage pattern of the different areas concerned and he would study very carefully whether the distribution of land good or bad for grass farming entered into the story of depopulation. A physical explanation of that kind is not necessarily to be found, but I think it has to be looked for. Would one find, for instance, that areas best fitted for arable cultivation did not suffer depopulation whereas areas that were marginal for arable cultivation suffered to a much greater extent?

You will agree with me that Mr. Beresford illustrates that aspect of history that touches our interests as geographers. I think Mr. Beresford will not mind me recalling to him that in a sense he is a very apt disciple of Professor Tawney, because it was he who said that what historians needed was not more documents but stouter boots!

A SPEAKER: May I ask a very ignorant question? Has the learned lecturer given any consideration to the possibility that this depopulation in the second half of the fifteenth century was brought about by the Wars of the Roses? We do know there was a good deal of harrying of tenants by rival landlords; extortion of rents twice over, raiding of villages and so forth.

Mr. BERESFORD: I think the answer is that local evidence about exactly what happened in the Wars is not easily accessible and I am afraid it is something which I rather put in the background. I think it is conceivable that what has

just been suggested will be found true in some places. More material perhaps is the second suggestion regarding general conditions of disorder. I am fairly convinced that the general disorder of the fifteenth century, of which the Wars of the Roses were part, will probably be a partial explanation of this particular phenomenon taking place at this particular time. However, I have no precise information on the question.

A SPEAKER: I would like to refer to the map of the Avon which Mr. Beresford showed. South of the Avon there were great areas of depopulation and north of the Avon there was none. I think that in Trevelyan's 'English social history' you will find that he relates the clearing of forest in the north with the result that that area, being more fertile, became arable; while the area to the south, not being so fertile, became an area of sheep farming. I think it is possible that some of the population from the south of the Avon moved to the newly cleared area to the north.

Mr. BERESFORD: I disagree, and imagine that either you or I have misread Trevelyan. I think he supposes the clearing to have been earlier than the late fifteenth century, although later than the general settlement of Warwickshire. In the fourteenth and fifteenth centuries depopulation did not occur north of the Avon but south, in the area which was cleared first and thoroughly nucleated. I do not think there is any indication of what has been suggested, north of the Avon, while the south was being depopulated. But I have an imperfect memory of what Trevelyan actually said.

The PRESIDENT: If there are no further questions, I will ask you all to join with me in according a hearty vote of thanks to Mr. Beresford.

THE SHIRA PLATEAU OF KILIMANJARO

GEORGE SALT

SINCE KILIMANJARO was discovered, a century ago, most travellers have approached it from the direction of the coast, that is, from the south-east. Seen from that direction the mountain appears to culminate in two summits. Nearer, on the east, Mawenzi thrusts its pinnacles to an altitude of 17,500 feet. Eight miles farther to the west the ice-crowned dome of Kibo exceeds 19,500 feet and provides the highest ground in Africa. Between the two the skyline is formed by a saddle-shaped ridge which nowhere passes below the 14,000 foot contour. That aspect of the mountain, unforgettable when seen on a clear morning from Moshi or Taveta, has dominated the popular impression

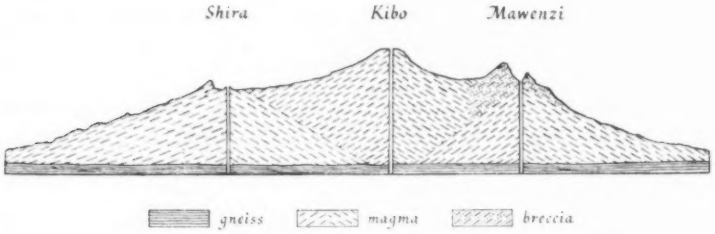


Fig. 1. The structure of Kilimanjaro (after Klute, 1920)

of its structure; and even students of zoo-geography have written of Kilimanjaro, and have published figures representing it, as formed of two summits with a plateau between.

That view is incomplete. The true structure of Kilimanjaro is different, and is best appreciated from its geological history. The immense mass of the present mountain is the product not of two volcanoes but of three; of which, in order of formation, Shira was the first, Mawenzi the second and Kibo the most recent (Fig. 1). The two earlier, Shira and Mawenzi, were separate volcanoes, their tops 18 miles apart and at least 13,000 feet high, when a third vent developed in the straight line between them. Its emissions covered the eastern side of Shira and the western side of Mawenzi with new layers of lava. Having their elevated slopes on which to build, the new volcano, Kibo, reared its crater high above its neighbours and also overflowed their flanks, so that the three were welded together on a common oval base. In this manner were formed the main contours of modern Kilimanjaro; a mountain of three principal summits with two plateaus between them.

The appreciation of that structure is of prime importance to this paper because it is to the two plateaus, and more particularly to the one on the west of Kibo, unseen in the view from Moshi, that attention is to be drawn.

The plateau on the east, between Kibo and Mawenzi, is known as the

Saddle. That part of it lying directly between the peaks (Fig. 2) is a relatively flat expanse of tawny sand strewn with boulders and supporting only a sparse vegetation, but its rounded edges on the north and south lead down to rocky slopes increasingly well covered with vegetation of a moorland type. Including the gentle slopes on its sides, the Saddle can be said to lie between 13,000 and 15,000 feet, and within those contours has an area of nearly 22 square miles; but the relatively level part between the two peaks, the Saddle proper, lies between 13,750 and 14,750 feet and has an area of only about 14 square miles. The Saddle is traversed by the ordinary route from Marangu to the summit of Kibo and has been provided on the west with the Kibo hut at 16,000 feet and on the east with the Mawenzi hut at about the same height.

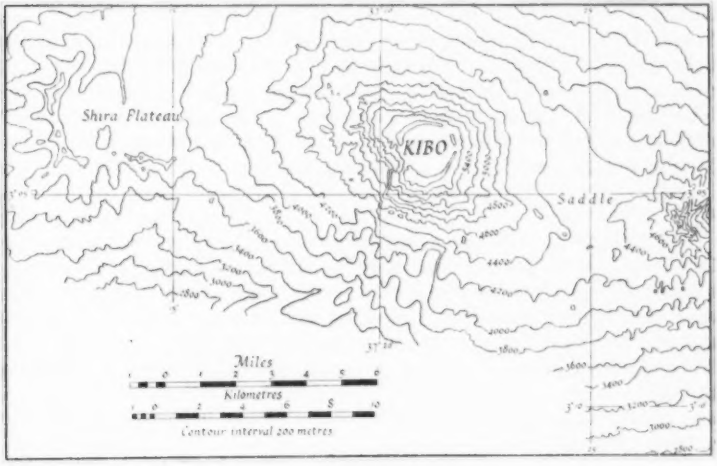


Fig. 2. Upper Kilimanjaro

It is therefore accessible in comfort, has been visited by a considerable number of tourists and is comparatively well known.

The plateau on the west is called the Shira Plateau on recent maps, although it formerly had another name. It is a tract of moorland roughly 5 miles across in each direction; level on the west where it abuts on the Shira Ridge, tilted upwards on the east where its gradually steepening slopes merge into those of Kibo (Fig. 2). It lies in general between 11,500 and 13,500 feet. Between those contours it has an area of over 24 square miles and is therefore larger than the Saddle. Since the Plateau is more difficult of approach however, and has no generally known route of access, it has rarely been visited and remains comparatively unknown to travellers.

In October 1948, D. W. I. Piggott and I ascended Kibo from the east and made botanical and zoological collections on the way. We followed the usual route from Marangu and reached the Kaiser Wilhelm Spitz on the fourth day, descending to Peters hut that night. The next day we went on the Saddle

again, whence Piggott made an excursion on Mawenzi while I studied the flora and fauna of the level part of the Saddle at 14,500 feet.

In the following month, when an opportunity occurred of making a second brief expedition on the mountain in the company of G. H. Swynnerton, it was decided to attempt the Shira Plateau. A party was formed consisting of B. Cooper, O. M. B. Milton, G. H. Swynnerton and myself, with twelve African porters. The enterprise received the patronage of the Game Warden of Tanganyika, Captain M. S. Moore, v.c., who provided transport, gave us permission to collect specimens in the Kilimanjaro Game Reserve, and encouraged us in many ways for which the whole party remains deeply indebted.

The principal object of the expedition was to collect and study the flora and fauna of the plateau, and the results will be published in appropriate biological journals. Since however it appears that no separate paper has hitherto been devoted to the region, of which the very existence has sometimes been overlooked, it is necessary first to sketch the geographical background of the biological work. My intention in this paper is to summarize and bring up to date all that is known of the geography, in the broad sense, of the Shira Plateau and the western flank of Kilimanjaro.

History

The first European visitors to the western shoulder of Kilimanjaro were the botanist Georg Volkens, the geologist Carl Lent, and Kurt Johannes, commander of the German military post at Moshi. On 11 March 1894 they left their camp in the Nguaro cave, north of the Saddle, and rounded the northern side of Kibo on a route varying in altitude between 9500 and 11,500 feet. They entered the plateau over its north-eastern edge and spent the night in the Galuma cave. The next day they continued in a south-westerly direction and descended the mountain to Shira. Of the plateau, which he calls merely a "Seitenplateau," Volkens (1897, p. 205) writes, ". . . einer ungeheuren, von Bergrücken fast ringsumzogenen Mulde, der ich (vielleicht, wie ich jetzt meine, überschätzt) eine Meile an Ausdehnung in jeder Richtung gebe." Since Volkens meant a German mile, which is about 4½ English miles, his original estimate was nearly right. His second thoughts however played him false, and his map shows a ridiculously small region to the north-west of the central cone.

Hans Meyer, the conqueror of Kibo, made four expeditions to Kilimanjaro, but not until the last of them in 1898 did he visit the western side of the mountain. Leaving a camp on the northern slopes of Kibo at 10,530 feet on 28 August 1898, Meyer and his companion, the artist Ernst Platz, entered the plateau at its north-eastern corner. They established their camp in the Galuma cave, but Meyer spent the night of August 30 in a bivouac at 14,290 feet from which he visited the lower part of the Drygalski glacier. On September 1, Meyer and Platz descended the mountain towards Kibongoto. Their route of entry and exit was therefore similar to that of Volkens but, having spent more time in the region, they obtained a much better idea of its topography. The map accompanying Meyer's third book on the mountain (1900) shows an adequate appreciation of the size of the plateau although the

delineation of several features, and especially the position of the Shira Ridge, is very inaccurate. It is interesting to notice that Meyer called the region the "Galuma Plateau," which is the earliest proper name applied to it in print.

In 1906 the western side of Kibo was visited by Fritz Jaeger and Eduard Oehler, who ascended from Machame, below its southern flank. Leaving that mission on 11 August 1906, they reconnoitred and cut a way through the upper forest and on August 15 established their third camp at 14,240 feet, below the tongue of the Penck glacier. They were especially interested in the structure of the central cone and in its glaciation, and worked principally on the Penck glacier and in the great south-western Breach. After five days, which included a visit to the Drygalski glacier and the Lent group and an unsuccessful attempt to reach the crater from this side, they returned to Machame on August 21 and 22. Jaeger and Oehler did not visit, and paid little attention to, the level ground beneath them on the west and north-west which they also called the Galuma Plateau. They did however distinguish and name as the "Basis Plateau" a relatively small triangular area, nearly 1000 feet higher than the main plateau, which lies at the south-western foot of Kibo above the Machame Escarpment. The account of this expedition published by Jaeger (1909) contains much information about the geology and glaciers of the west side of Kibo.

Oehler was so fortunate as to return to Kilimanjaro. In 1912, in company with the geographer Fritz Klute, he spent nearly five months on the mountain making a photogrammetric survey. During half of that time, from early August until mid-October, these two were based on a camp above the Machame Escarpment at 13,645 feet, and made many valuable observations on the climate, geography and geology of the west side of the mountain, including the plateau. From that base they made the first ascent to the crater rim from the west. They also descended and camped for several days at about 12,000 feet on the western side of the plateau near the Shira Ridge. Several publications record the results of their expedition, but only three need be mentioned here. Oehler (1915) wrote a narrative of the tour which is both interesting and useful as a general description of the topography. Klute (1920) published a treatise on the geography, in the broad sense, of Kilimanjaro which no student of the mountain can afford to neglect. With that book, and with another paper (Klute 1921), was published the map based on their photogrammetric survey. It is, as Gillman wrote, indispensable for the study of upper Kilimanjaro.

Since 1912 there seem to have been very few visits to the plateau, and none that has been specifically reported. From a paper by Cotton (1930), listing plants collected on Kilimanjaro, it appears that A. E. Haarer collected botanical specimens on the "Shira Mountains" in the nineteen-twenties. It is said that two settlers, Hueter and (?) Landgrabe went on the plateau in the nineteen-thirties. A carton bearing Hueter's name and a copy of the *East African Standard*, dated 3 August 1934, which were found by our party in a small cave below the Drygalski glacier, support the claim. In 1934 R. Reusch drew up for the Tanganyika Railways a map of upper Kibo which shows, according to Gillman, the route of "the first Kibo Circuit Expedition" across

the higher slopes eastward of the plateau but adds nothing to Klute's map on the plateau itself. On the authority of Reusch, Moreau (1944, p. 5) writes ". . . on the Shira Plateau a semi-permanent pond is fresh during the rains, salty later in the year and usually dry in January and February." If it is soundly based, this statement implies several visits to the plateau of which no record has been found. In February 1944, J. J. Richard went up Jaeger's route over the Machame Escarpment seeking evidence of recent tectonic or volcanic activity. From the few sentences about this tour in his note (1945) it does not appear that he visited the plateau. One of our own party, B. Cooper, in company with J. Davidson reached the edge of the plateau in November 1944 by crossing the Shira Ridge and descending to the bog below it. In July 1945 Cooper went up by the route to be described below, camped in the Lent Valley and visited the snout of the Penck Glacier. If there have been visitors to the plateau in addition to these, none of them seems to have published any account of his expedition.

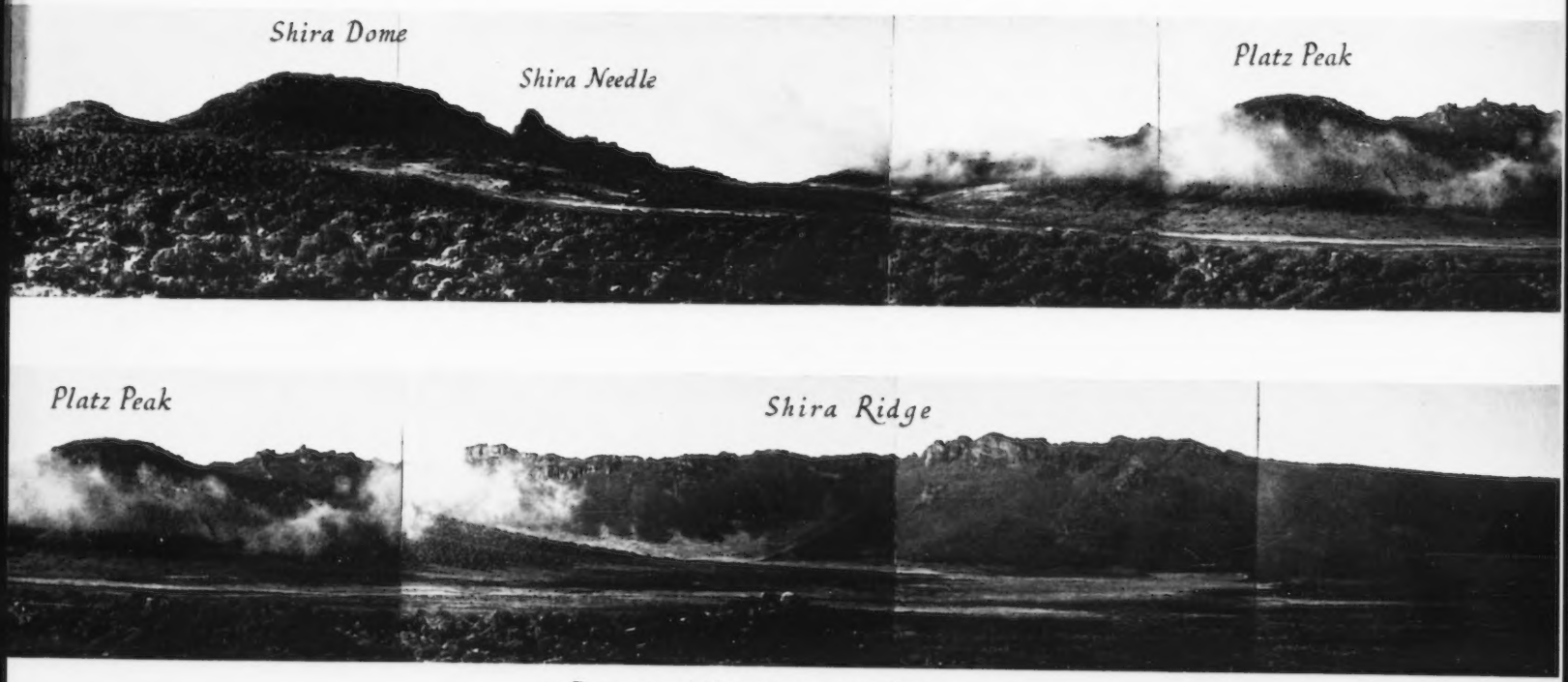
The nomenclature of the plateau

A matter of nomenclature had better be cleared up at this point. Throughout their publications, Meyer (1900), Jaeger (1909) and Oehler (1915) agree in calling the western shoulder of Kilimanjaro the Galuma Plateau. Klute (1920) however, besides using the name Galuma Plateau several times, also introduced the new name Shira Plateau. On page 61 of his book he wrote, "Vom Kibo senken sich die Westhange von 4500 m. langsam zum Schira, dessen alter Kraterboden auf grosse Erstreckung zwischen 3600 und 3800 m. Hohe bleibt. Diesen Teil nannten wir Schiraplateau." And he went on to distinguish it from the Basis Plateau of Jaeger. In one sentence (p. 110), Klute used both names, Galuma and Shira, clearly referring to distinct areas. Apparently he intended to distinguish three regions: the high south-eastern Basis Plateau; the old crater floor, or Shira Plateau; and a third region, presumably the level area to the north of these two, the Galuma Plateau. Since Klute's map did not include all of the northern part of the shoulder, the name Galuma is not to be found on it. Perhaps as a consequence on modern maps, for instance E.A.F. sheets 1283 and 1716, the whole region is marked as the Shira Plateau. Much as one would prefer to retain the original name, Galuma Plateau, so called after a fugitive chief of Kibosho, it is hardly possible now to reverse the practice of recent years. In this paper the name Shira Plateau is used, reluctantly, in place of Meyer's Galuma Plateau to mean the whole western shoulder; and not in accordance with Klute's definition which would restrict it to a smaller area near the Shira Ridge.

Narrative of the journey

Ngare Nairobi at the western foot of the mountain can be reached by car from Moshi in about two hours. A track practicable for cars leads beyond Ngare Nairobi to the Simba Estate, situated some 5 miles to the north-east at about 5600 feet. From the end of that track the journey on foot begins.

Most of our porters left Ngare Nairobi on November 23 with four pack donkeys and, making what distance they could, spent the night in the forest. This arrangement allowed the Europeans, who foregathered at Ngare Nairobi



1. Panorama of Shira plateau from the base camp

2. Part of the plateau, looking westwards from Lent Valley

3. Part of the plateau, looking northwards from Platz Peak

that evening, to march much more quickly the next day, and brought the whole party together on the afternoon of November 24.

Our route followed the right bank of the gorge of the Ngare Nairobi North, a river which is called the Sesane by the Chagga inhabitants of the region. A tributary from the north-east, the Loldorosi, was crossed at about 6300 feet. The whole day's journey lay through the forest zone that surrounds the mountain. In large part the forest was composed of brown olive with *Ilex*, *Agauria* and other low trees; in part of the much more lofty pencil cedar and *Podocarpus*. It contained many glades, thirty to a hundred yards or more across, of grass or of rank shrubby vegetation. No bamboo was seen. Undergrowth in the forest was rarely very dense and passage was relatively easy; in the shrubby glades game tracks, especially those of elephant, saved a good deal of cutting. The slope also was easy with only two or three stretches of steeper ground and the European members of the party took only five and a half hours to walk from the Simba Estate to Camp 1.

That camp was established at 8620 feet in a cave at the head of a ravine plunging steeply into the gorge of the river. A small stream draining a boggy area above the ravine poured over one end of the roof and provided easily accessible water. The situation of this camp at the upper edge of the forest was ideal for a study of the transition from forest to moorland, and a day's delay occasioned by donkey trouble was profitably spent there in making observations and collections of the flora and fauna.

On November 26 we moved upwards to the east, skirting at about 9600 feet the head of a tributary gorge from the north-east. Between 9000 and 9800 feet the ground was rather steeper, with bare rock showing through the moorland vegetation of heaths, *Artemisia*, *Protea* and bracken. A relatively level area above was dominated by *Adenocarpus mannii* 8 to 10 feet high and in full bloom. This gorse-like but fortunately spineless legume grows so densely as to hinder passage, especially with head loads. Steeper and rocky ground between 10,000 and 11,000 feet was covered almost exclusively by heaths of the genus *Philippia*, growing as compact bushes 6 to 8 feet high and of about the same diameter. These were well-spaced and it was easy to push a way between them.

Above 11,000 feet the angle of the ascent gradually eased and we soon found ourselves at the edge of an extensive plain which seemed in comparison with the slopes behind us to be quite flat. A little more than six hours after leaving Camp 1 we reached a small cave in the right bank of the Sesane at 11,700 feet, opposite the northern end of the Shira Ridge. This cave would provide emergency shelter for a small party but we preferred to push on to a more adequate site. After walking for another hour and a half in a south-easterly direction across nearly level ground we came to a series of large caves north-west of the lower end of the Lent Valley. One of them, open to the west, offered spacious and comfortable lodging with water accessible in small rock pools a few yards to the south. There we established our second camp.

The altitude of this camp, as indicated by the average of several readings, is 12,450 feet; and its position is fixed by the following compass bearings: to highest point of Shira Ridge 274°, to Shira Needle 228·5°. The cave we used

may be the one illustrated by Meyer (1900, p. 164) as the Galuma Cave, but there are details in his figure that we cannot reconcile with our photographs and a discrepancy of nearly 500 feet between his reading of the altitude and ours.

The cave was occupied from November 26 to 30. During those days different members of the party crossed the plateau in various directions, noting the vegetation and making collections on the way. The courses of several streams were followed, most of the higher points on the south, west and north were visited, and an excursion eastwards was carried as high as the snout of the Drygalski glacier at about 16,000 feet. On November 30 the party went down to Camp 1, and on the following day returned to Ngare Nairobi by the route of ascent.

There is no objective difficulty about this route, which is probably a good deal less steep than Jaeger's route by the Machame Escarpment. It is well marked topographically but not of course by other means; our party was therefore indebted to B. Cooper's previous experience of it which saved us a good deal of time and labour.

Topography and soil

The boundaries of the Shira Plateau are clearly marked by topographical features on two sides but must be chosen arbitrarily on the other two. On the west it is walled by the Shira Ridge, an abrupt escarpment which rises 800 feet above the level ground along most of its length but near its northern end decreases in height and eventually disappears (Fig. 3 and Plate 1). The southern edge of the plateau is also raised, but much less abruptly, and only isolated hills (Shira Needle, Shira Dome and East Shira Hill) rise sharply above the general level. On the east it is difficult to find a topographical limit since there is no abrupt change in the steepening slopes. For the purposes of this paper the 4200 m. (13,776 feet) contour on Klute's map will be used as an arbitrary boundary. On the north again there is no real edge because in that direction the surface of the plateau turns, at first slowly and then more steeply, downwards into the northern slopes of the mountain (Plate 3). The 3500 m. contour would be the most suitable limit, but unfortunately that contour is incomplete on Klute's map which is the only one sufficiently detailed for study. In this paper the nearly complete 3600 m. (11,808 feet) contour will therefore be used.

If these arbitrary boundaries on the east and north are accepted, the area of the plateau can be taken to be about 24 square miles. It is nearly $6\frac{1}{2}$ miles from east to west and in that distance it loses 1650 feet in altitude, an average gradient of one in twenty. It is about 5 miles from south to north, in which distance it loses 650 feet, an average gradient of one in forty.

Within this area the most marked topographic feature is Platz Peak, which rises nearly 700 feet in the south-western corner (Plate 1). It is said by Klute (1920, p. 70) to represent the eruption cone of the ancient Shira volcano; while the Shira Ridge on the west and the series of hills on the south are relics of the old crater wall. The eastern and higher part of the plateau has a broadly corrugated surface due to lava flows radiating from Kibo, which overran the crater wall of the Shira volcano on the east and north. A long

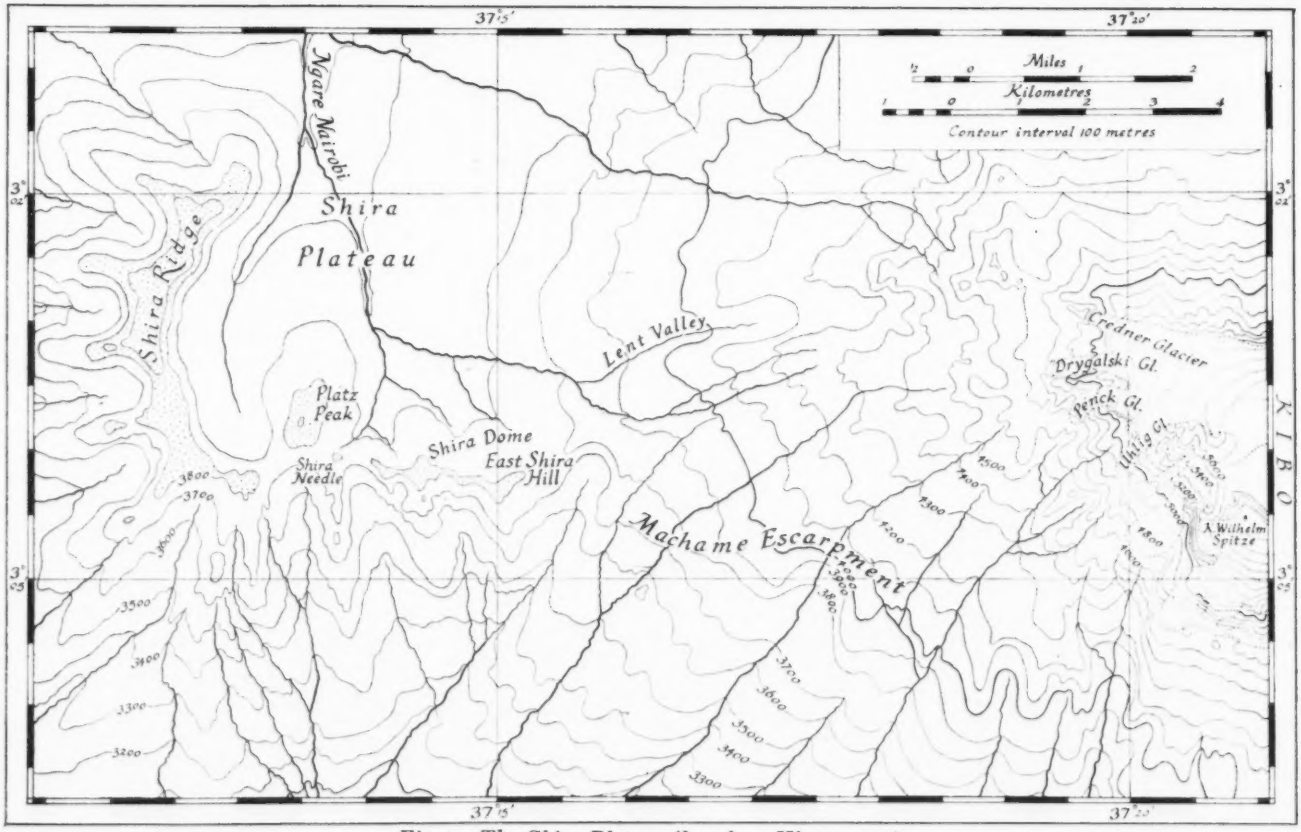


Fig. 3. The Shira Plateau (based on Klute, 1920)

low escarpment presenting its face to the west runs north and south near the middle of the plateau in its northern half, and may represent part of that crater wall. Two low hills on the north are probably the remains of small parasitic cones.

The main outlines of the plateau formed by volcanic activity have not been greatly altered by erosion. The eastern edge is conspicuously divided at about its middle by the Lent Valley which was gouged out by a glacier and is bounded by high lateral moraines. Effects of erosion by water are inconspicuous over most of the area, partly because the volume of water on the plateau is small. Nevertheless at the north-western corner, where the drainage is collected into the Sesane, the streams have worn gorges, narrow but in some places as much as 80 feet deep. Signs of frost- and desert-weathering are frequent but, since the rocks of both Shira and Kibo were laid down as lava and form a hard protective surface which has weathered evenly, these forces have not much changed its form.

Although smaller streams flow westwards from the slopes of Kibo, the main drainage of the plateau is from south to north. The level ground about the northern end of Platz Peak (Plate 2) is occupied by an extensive bog, in which streams from both sides of that hill break up and become lost. After seeping through the hummocks of grass and sedge, the water gradually collects into streams at the northern edge against a raised rocky platform. In the bog are a few small pools only three or four yards across; at the time of our visit (late November) their bottoms were of clean sand and the water in them, about a foot deep, was clear and sweet.

There is some variety in the material forming the surface of the plateau. Over part of it rock is exposed; chiefly basaltoid trachydolerite on the west, where it is of Shira origin, and rhomb-porphyry on the east where it came from Kibo. Large and small boulders of this grey rock are strewn over most parts of the plateau. On the northern half small pieces of obsidian are common and arrow-heads chipped from that material were found in a cave. Small areas of lapillae and volcanic sand are frequent but not extensive and the greater part of the plateau is covered by what can properly be called soil.

Samples of soil taken from two places at about 12,500 feet contained coarse sand particles but also had a large humus content. These were collected with a standard sampling tool which removes a cylinder of soil $2\frac{1}{2}$ inches in diameter, and no difficulty was experienced in pushing it to a depth of 8 inches. The soil was therefore not merely a thin covering. A very dark peaty soil was observed in the bog to the north of Platz Peak. Unfortunately it proved impossible to arrange for chemical analyses of the soil samples brought off the mountain.

The glaciers

The ice-cap of Kibo, little more than a circlet on the north and east, is well developed on the south and west where it descends far down the cone and ends in a fringe of glaciers. On the west, northwards of the great Breach and above the Shira Plateau, three principal glaciers and two smaller ones were recognized by the German geographers and were named, reading from

the north, the Credner, Drygalski and Penck glaciers, with the less massive Klein Penck and Uhlig glaciers nearest to the Breach.

The extent of the ice-cap and of these glaciers in 1898 is illustrated in Meyer's book of 1900 by a retouched photograph facing page 177. That illustration shows that the glaciers were then broad, with blunt, rounded snouts; and that they descended from an ice-cap fully half as high as the central cone itself. There is no illustration in any later work that can be compared directly with Meyer's, although Jaeger's Figure 7 serves to show that in 1906 the Penck glacier had not altered greatly. It was however mentioned by Oehler (1915, p. 144) that the Credner glacier, which at the time of Jaeger's visit was bi-lobed at the tip, was tri-lobed in 1912, and showed other signs of regression.

The state of the western glaciers in 1948 is clearly shown in Swynnerton's photograph (Plate 4), taken from the roof of the cave that was our base. Comparing that photograph with Meyer's view of fifty years earlier, it can be seen at a glance how greatly the ice-cap has receded in the meantime, and how far towards the crater rim the bare rock between the glaciers now extends. The Credner glacier has retreated and its snout is now divided into four lobes, but it has retained most of its great breadth. The Drygalski, formerly as broad as the Credner, has lost its northern half and now takes a narrow crooked course between wide wedges of exposed rock. The Penck glacier has become divided by a rib of bare rock that reaches nearly to the crater rim, probably to the point of exposed rock that was called the Ravenstein by the German explorers. Its northern half, a slender finger of ice, still extends much lower than the Credner or Drygalski glaciers; its southern half, of which the Lesser Penck seems to be merely a tongue, now ends at an icefall well up the side of the cone.

Only one day of our visit to the Plateau could be spared for an excursion above its eastern limits, but observations of the Drygalski glacier made on that occasion add detail to this general picture of receding ice. On November 28, unfortunately a day of continuous mist and cloud, we walked up the northern moraine of the Lent Valley, turned southwards around its head beneath the cliffs of the Lent Group and made our way over ridges of lava and flat expanses of fluvio-glacial debris to a cliff with great icicles beneath the terminal moraine of the Drygalski glacier. Passing that cliff on the north we moved upwards, first to the east and then to the south, so as to reach the sharp edge of the Drygalski north moraine at about its middle. Thence one of the party continued along the moraine towards its origin on the rocks of Kibo. On the descent a more direct route was made to and along the southern edge and moraine of the Lent Valley.

Being quite ignorant at the time of our visit of the German expeditions to the Plateau, we did not know that Meyer had visited the Drygalski glacier in 1898 from a bivouac near the head of the Lent Valley; that Jaeger in 1906 had left a row of stones across the Penck glacier in order that later visitors could observe what movement had taken place; or that Klute and Oehler built cairns to indicate the position occupied by the snout of the Drygalski glacier in 1912. It did not much matter. All but one of Jaeger's stones had disappeared when Klute looked for them six years later, and if Klute's cairns

remain and we had found them they could have provided only historical interest. More permanent and far more illuminating than stones and cairns, Meyer's published photographs permit a detailed comparison of conditions in 1898 and in 1948.

With the exception of one feature, the photograph facing page 171 of Meyer's book might have been taken in 1948. Even the massive icicles, formed by the water seeping through the terminal moraine and dripping down the cliff below, are still formed in the same place. The exception is the snout of the glacier, clearly visible above its terminal moraine in the view of 1898, which would be absent if the photograph had been taken fifty years later. At the time of our visit dull cloudly weather with snow flurries prevented clear views and it is embarrassing to suggest a comparison of Plate 5 with Meyer's fine plate; but although taken from much farther away my photograph shows the cliff with the icicles, and the terminal moraine above it, just as they were in 1898, but the snout of the Drygalski glacier now far behind.

Two other illustrations in Meyer's book, facing pages 360 and 368, allow further comparison. The first of these shows a nearly level stretch of ice, occupying two-thirds of the view, as seen from the north moraine of the Drygalski glacier at about its middle. Our party came to the crest of the moraine at about this point and found, instead of ice, an empty trough 200 feet or more deep. Meyer's plate facing page 368 is still more illuminating. One of our party passed very near the point from which that photograph must have been taken and fortunately made an exposure in spite of the lowering clouds (Plate 6). Poor as it is, it serves for comparison with Meyer's view of fifty years earlier, showing the nearer (north) and farther (south) moraines, the trough empty of ice, and the snout of the Drygalski glacier ending, in 1948, on the steep rocks far above and well to the south of the trough it formerly filled.

If the ice-cap and glaciers continue to recede during the next fifty years at the same rate as they have done since Meyer's visit, little ice, if any, will be left on the western side of the mountain by the end of this century. Whatever might be the effect on climate and rainfall and crops, there can be no doubt that the disappearance of that gleaming dome would be a grievous aesthetic loss.

Climate

The prevailing winds in the Kilimanjaro region are the south-east trade which usually holds from May to October and the north-east monsoon which blows from December to March. On the mountain itself two other directional winds are felt: an anti-trade which occurs at high altitudes, usually above 13,000 feet, and a local south-west wind of disputed origin. In addition to these directional winds, heated air from the Masai steppe causes an updraught during the day, while cold air from the ice-cap causes a down-draught at night.

The Shira Plateau lies near the altitude of the zone between the trade and anti-trade winds but, being sheltered by high ground on three of its sides, probably receives the full force of neither. Rising currents of warm air carry

cloud from the forest zone above its edges, and during our brief visit the plateau was usually walled with cloud on the south after the middle of the morning. At night, cold air from the ice-cap, which is especially extensive and descends particularly low on this side of the mountain, seems to settle and collect in the shallow basin of the plateau; and the cold persists in the morning because the great bulk of Kibo directly to the east shadows the region until a late hour.

Records of the rainfall on the Shira Plateau are entirely lacking, and the precipitation there can only be surmised from measurements made elsewhere on the mountain. Nine rain gauges are maintained on Kilimanjaro by the East African Meteorological Department and the Director, Mr. D. A. Davies, kindly allows me to arrange some of the data collected by his Department in the following table.

Rainfall (in inches) at different altitudes on Kilimanjaro

Gauge	*Altitude in feet*	1945	1946	1947	1948	1949	*Average of 5 (4) years*
1E	7,200	67·12	44·17	NR	70·58	68·86	62·68
2E	9,400	73·06	62·37	71·23	91·44	58·23	71·27
3E	12,500	37·60	19·76	21·95	21·47	18·83	23·92
4E	14,000	7·78	9·95	3·59	9·47	3·28	6·81
5E	16,000	1·75	4·19	1·47	4·60	2·80	2·96
6E	19,000	0·07	0·60	0·30	0·35	0·10	0·28
1W	9,950	NR	38·93	63·55	61·07	48·92	53·12
2W	13,100	NR	28·38	49·91	43·13	38·46	39·97
3W	15,350	NR	6·93	0·97	1·31	0·29	2·38

In attempting to apply these data to our purpose two principal factors, altitude and aspect, have to be borne in mind. It is well known that the annual precipitation on the flanks of Kilimanjaro increases with altitude to a maximum at about 8000 feet and then falls off rapidly, so that the higher regions are relatively dry. It seems also to be established that precipitation at the higher altitudes is greatest on the south-west, because on that side the moisture-containing clouds from the forest zone can ascend higher before they meet the drying anti-trade wind.

Three gauges, 3E, 4E and 2W, are situated at the altitude of the Shira Plateau, and the means of annual rainfall indicated by them range from 6·8 to 40 inches a year. Of the three, gauge 2W is nearest to the plateau, being situated on the Machame Escarpment below the great Breach, but this is the wettest aspect of the whole mountain and it is almost certain that most parts of the plateau receive far less rainfall than the 40 inches recorded from that gauge. On the whole it seems likely that the rainfall varies considerably in different parts of the plateau, and that while it may be as high as 30 inches a year in the south-western region it is probably only 8 or 10 inches a year in the more northern parts.

It has to be borne in mind that for ecological purposes measurements of the precipitation are only part of the story. In late November at least, damp

mists frequently moved across the plateau, condensing on the vegetation. They provide moisture not measurable in terms of rainfall but doubtless of importance to both the flora and the fauna.

The only continuous readings of air temperature on Kilimanjaro at about the altitude of the Shira Plateau are those of Klute (1920, pp. 36–7). He established a weather station above the Machame Escarpment at 13,645 feet, and published temperature readings for most days between 19 August and 12 October 1912. From his tables the following means can be calculated:

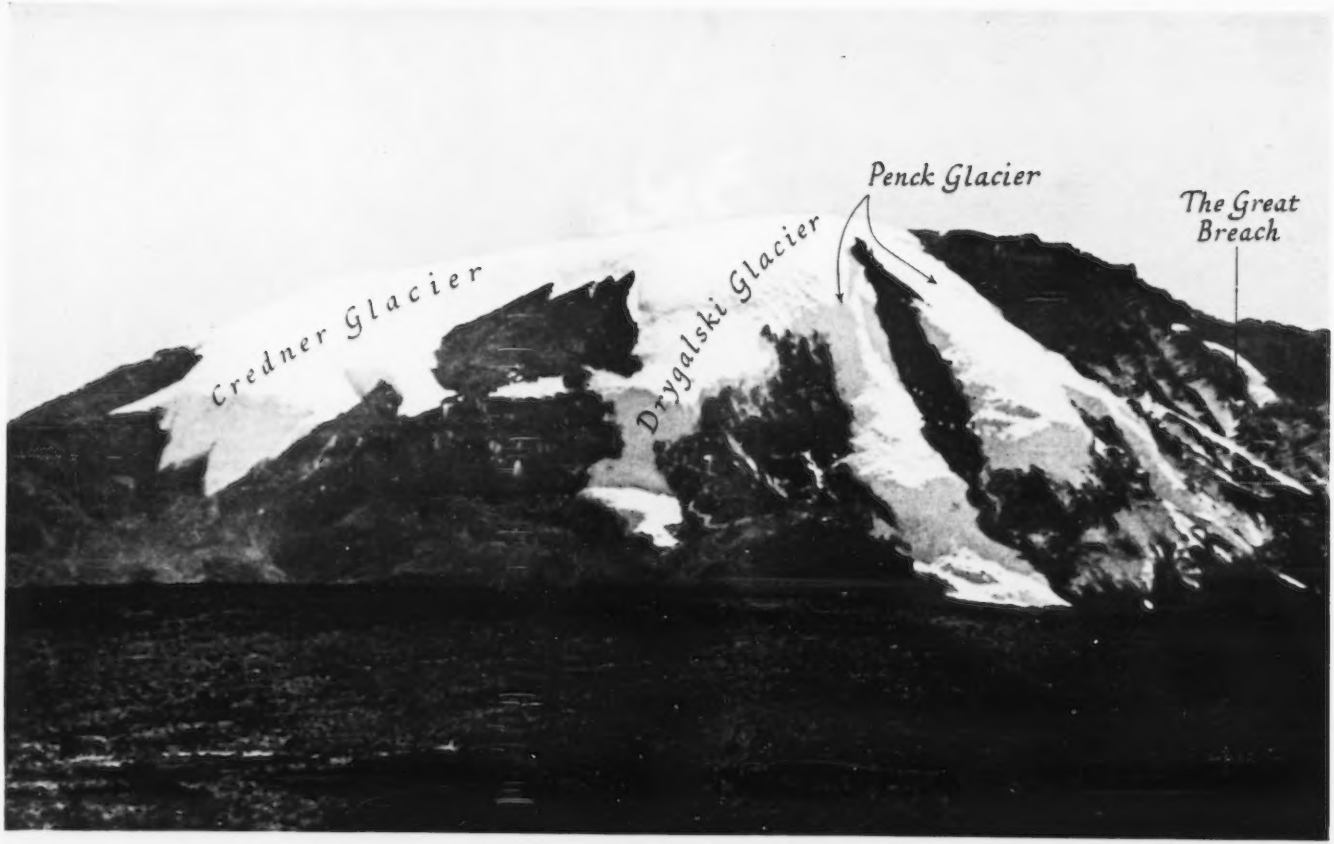
7 a.m. (48 readings) mean + 0·1° C.; min. −2·8°, max. + 3·2°.
2 p.m. (48 readings) mean + 5·6° C.; min. + 1·5°, max. + 9·5°.
9 p.m. (47 readings) mean + 0·5° C.; min. −1·0°, max. + 2·8°.

On only one day during the period was the minimum temperature above freezing point; the maximum air temperature recorded was 11·5° C. The average daily range of variation was 10·0° C. It may give these data more substance to remark that the means are lower than the mean figures for Cambridge in January (daily min. 1·1°; daily max. 7·2°); but the comparison raises a misleading image in the mind unless one thinks of cold but brilliant days with skating on the fens.

These are air temperatures, taken in a shelter. From an ecological point of view the most interesting characteristic of temperatures at high altitudes in the tropics is the very great and very rapid change of sun temperatures. Owing to the thin atmosphere, and the vertical direction of the rays, high sun temperatures have been recorded. At 13,612 feet, at noon, Klute made the following simultaneous measurements: sun temperature 51·5° C.; surface temperature (on stone, the bulb of the thermometer covered to a depth of about 1 cm. with sand) 39·5° C.; air temperature 8·3° C. Meyer (1900, p. 165) records one reading at 11,950 feet of 87·5° C. sun temperature with air temperature 14° C., and another (p. 171) at 14,290 feet of 73° C. sun temperature with 6° C. air temperature; but one would require more detail of the method used in taking these readings before attaching great weight to them.

As soon as the sun is obscured by cloud the surface temperature falls very rapidly, and on cloudy days and at night the surface temperature is much the same as the air temperature, that is, not far from zero. Objects such as the leaves of plants must therefore be subject to violent changes. Perhaps for the same reason, small animals on the plateau were rarely seen exposed. It was a matter for surprise how very seldom an insect was in evidence even where many were known to be about. This subject will be discussed more fully in another paper.

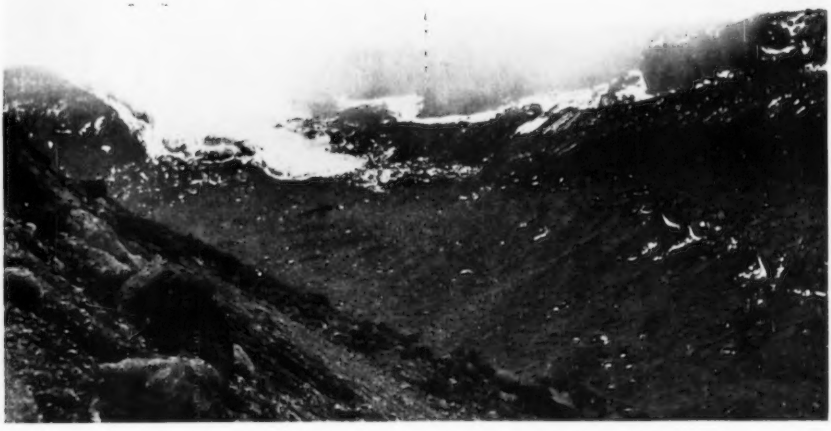
The minimum temperature may well be the effective limit to some forms of animal life on the plateau. On each of the four nights spent in the cave at 12,450 feet there were sharp frosts; heavy rime formed on the vegetation and thick ice on pools of water. Water held between the rosette leaves of giant lobelias was frozen solid. The lowest temperature we observed was −2° C. at 4 a.m. Klute's screened thermograph at 13,645 feet gave a mean minimum air temperature (fifty readings) of −1·8° C., with an absolute minimum of −4·0° C., but his unscreened minimum thermometer recorded −7·3° C. at



Phot. G. H. Swynnerton

4. Glaciers of the western side of Kibo

5. Tongue and trough of Drygalski Glacier, 1948



6. Trough of Drygalski Glacier from its northern moraine, 1948

13,218 feet, −7·9° C. at 14,202 feet and −8·2° C. at 14,235 feet. Since at this altitude the surface temperature at night is much the same as the air temperature, insects and other small animals, whether on the vegetation or on the surface of the ground, must be able to withstand temperatures at or below the freezing point for nights constantly of about twelve hours.

Biology

The vegetation and fauna of the Shira Plateau are to be described in another paper and it will be sufficient here to draw preliminary attention to only one point, namely the place of the plateau in discussions of the distribution of animals on East African mountains.

Between the forest, which surrounds Kilimanjaro to an altitude varying between 8500 and 9500 feet, and the ice and rock of the highest elevations, two principal life-zones have usually been recognized. The lower of these with its limits at roughly 9000 and 14,000 feet is a zone of moorland; the upper, between 14,000 and about 16,000 feet, has been called the zone of alpine desert.

The moorland zone has a very considerable flora of heaths and grasses, together with many other bushes and herbs. Near its lower limit it is largely covered with dense shrubbery, 8 feet or more high; and nearly as far as its upper limit the moorland carries, in all but the most unsuitable places, a moderate covering of low bushes or grass. The moorland can provide therefore not only a great amount but also a considerable variety of food, shelter and nesting material for animals. The birds and larger mammals that frequent the moorland zone have been observed and listed; other animal groups, the invertebrates and even the small mammals, are still very imperfectly known. Nevertheless it is clear that the moorland has a varied and fairly abundant fauna.

The zone of alpine desert, as its name implies, is largely a waste of sand and stones with an impoverished flora of about a dozen higher plants. Even these are dwarf and widely spaced. On the alpine desert therefore only a small quantity and a restricted variety of vegetation is available either as food or shelter or nesting material. It is not surprising that the number of kinds of animals known to live in this inclement zone is small. Although zoologists are still very ignorant about what animals do live there, it is certain that the fauna will turn out to be much smaller and far less varied than that of the moorland zone.

Of the two plateaus on Kilimanjaro one, the Saddle, lies almost entirely in the zone of alpine desert; the other, the Shira Plateau, in the moorland zone. It is to be expected therefore that the fauna of the Plateau will, when it is known, turn out to be much richer than that of the Saddle.

Moreover, it is likely that the Shira Plateau will be found to have a more abundant fauna than the other moorlands on the steeply sloping sides of the mountain. Some habitats, for instance extensive bogs, ponds, or accumulations of soil not perpetually subject to creep, can scarcely be found on steeply sloping ground; but they occur on the Shira Plateau and in them are to be found animals apparently absent elsewhere on the mountain.

Two clear examples can be given here. In a very useful paper Moreau

(1944) brought together what was known of the bird and mammal fauna of Kilimanjaro and compared his list with the catalogue of birds and mammals known to occur on Mount Kenya. He pointed out that snipe, which live on Mount Kenya, had never been found on Kilimanjaro and remarked that one might have expected to find plover in the moorland habitat though none had ever been seen. During our brief visit snipe were observed on several occasions and a plover was seen once (Swynnerton, 1949). Thus, even in these few days, two gaps in the Kilimanjaro list were filled.

Other groups of animals have not been so thoroughly sought as the birds and it would be difficult at present to find other examples to demonstrate so convincingly the importance of the Shira Plateau for zoo-geographical studies. Nevertheless some of the collections we made on the plateau have already considerably increased the list of animals known from upper Kilimanjaro. Swynnerton's notes (1949, p. 11) of the mammals trapped or seen during our expedition add greatly to the knowledge of those animals, and several species of insects and spiders new to science have already been described and named by authorities on those groups. When all the various collections we brought down have been studied—the reptiles and beetles, flies and bugs, springtails and mites—we shall have, though far from a complete view of the fauna, at any rate a much better view than we had before. To that extent we shall then be on surer ground when we compare the faunas of the different mountains of East Africa with a view to tracing the geographical distribution of animals.

Acknowledgements

The debt of the whole party to Captain M. S. Moore, V.C., Game Warden, has already been acknowledged. My own thanks are gratefully offered to my College and to the Colonial Office for making it possible for me to visit East Africa; and to my companions, G. H. Swynnerton, O. M. B. Milton and B. Cooper, for their cooperation and friendly help in reaching and studying the Shira Plateau.

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DISCUSSION

Evening Meeting, 20 November 1950

Before the paper the PRESIDENT (Sir HARRY LINDSAY) said: Dr. Salt is a Fellow and Tutor of King's College, Cambridge. His subject is biology and one of his hobbies is the study of animal life at high altitudes. Dr. Salt spent part of his boyhood close to the Canadian Rockies and I think he was inspired by them to regard mountaineering and animal life at high altitudes as his first loves. He has also travelled in the Andes and the Swiss alps. This evening he will discuss the geographical aspects of his visit to the Shira plateau and the results of his inquiries into problems of animal life at high altitudes.

Dr. Salt then read his paper

The PRESIDENT: We have listened to a most interesting paper and I hope that we may now have an equally interesting discussion. I will invite Dr. Hindle, Scientific Director of the Zoological Society and a distinguished member of the Council of our Society, to speak.

Dr. EDWARD HINDLE: As a zoologist I have of course been most interested in the latter part of the lecture, but I feel sure none of us have been disappointed in the geographical part of it. It is to me a source of great satisfaction to find that another zoologist can give such a good account of his travels.

I have known Dr. Salt best as a distinguished entomologist who has worked on the habits and behaviour of Hymenoptera and various creatures of that kind, and I must confess to a slight disappointment (perhaps that is too strong a term) for I had hoped he would touch on the biological and psychological behaviour of animals at high altitudes. The Director of the station on the Jungfraujoch, Professor von Muralt, told me that at such high altitudes the psychological centres are completely changed; that one has a much greater appreciation of the finer things of life: the taste of wine, the beauty of the scenery and so on; and apparently everyone says what marvellous wine is served at the Jungfraujoch restaurant and what a marvellous restaurant it is. That is due to the fact that their critical sense is diminished at that high altitude and they think everything in the world is lovely! Such a biological effect might be detectable in animals. But according to our lecturer the only animal in regard to which psychological approach was made was the donkey, and I do not know whether that animal's behaviour was due to the high altitude or not. Joking apart, life at high altitudes does present an interesting problem. I might add that it is a problem which has attracted a number of Cambridge biologists. Sir Joseph Barcroft, a member of Dr. Salt's own College, led an expedition to the Andes to study life at high altitudes.

The effects of temperature are extremely puzzling. In India for example the surface temperature of the desert commonly reaches 65° C. and yet it is possible to isolate at any rate the spoor of living animals, and just below the surface there are ordinary rodents and other forms of life; but it is to be remembered that such a high temperature is only found at the surface, and most animals burrow to escape both high temperatures and low. Still there is always the question of oxygen lack, of reduced atmosphere and, as Dr. Salt has said, the extremes of day and night temperatures.

Dr. Salt has referred to one or two animals which, if you are interested, you can see at the London Zoo, one being the Colobus monkey, a most interesting creature which in Kenya at any rate has a race which is snow-white. Its long coat is supposed to resemble the lichen growing on some of the trees in its

native haunts. It is almost impossible to keep that monkey for long in captivity; we get them occasionally and have four at the Zoo now. We also have a whole collection of the sun-birds he spoke of, really very splendid birds with feathers of the most beautiful metallic colours.

Asked at what height he had seen butterflies, Dr. Salt replied: On Kilimanjaro, not higher than about 12,000 feet, though a skipper was seen at about 12,200 feet on the Shira plateau. If you want high records you must go to Ruwenzori and Mount Kenya. On Ruwenzori I collected a *Charaxes* not more than 200 or 300 feet below the top of Mount Speke, which is about 16,000 feet. May I add, in comment on Dr. Hindle's remarks, that I should much like to see psychological work done on high altitude animals, but one would have to be very careful of the psychology of the investigator himself!

Asked if the huts used during the expedition were maintained by any mountaineering club and whether they were available for shooting expeditions, Dr. Salt said: The huts on Kilimanjaro are exclusively on the south-east side, the ordinary route. There are four of them: the Bismarck hut at 8900 feet, Peters hut, 12,500 feet, Kibo hut at 16,000 and Mawenzi hut at 16,000. They are maintained by the Mountain Club of East Africa, and are available to anyone who gets into touch with the officers of that Club, but not for shooting because the whole of Kilimanjaro is a game reserve.

Asked at what height reptiles were seen, Dr. Salt said: The highest lizard we actually caught was on the top of the Shira Dome which, in round figures, is 13,000 feet. We also found the sloughed skin of a snake on the plateau at about 12,000 feet. Lizards occur fairly commonly on the eastern side at about the height of Peters hut, which is 12,500 feet.

The PRESIDENT: If there are no further questions may I ask you to join me in according a very hearty vote of thanks to Dr. Salt for his most interesting lecture. I do not think I have ever before seen a lecturer use his slides so well as illustrations of what he had to say.

THE CHARCOAL IRON INDUSTRY IN THE EARLY EIGHTEENTH CENTURY

B. L. C. JOHNSON

THE EARLIEST known comprehensive list of ironworks in England and Wales was compiled in 1717 [1] and source material for the study of the charcoal-iron industry prior to this date has been fragmentary, and for many areas almost non-existent. A most valuable set of manuscript ironworks accounts has recently been made available to me and most of them refer to the period 1688–1717,[2] although for no works are the accounts complete for all these years. The papers cover ironworks in the central, north and west Midlands, the Forest of Dean, north and south Wales, and Sussex, though in the last three districts a total of only four works is involved. In addition to the manufacturing and commercial activities of the concerns to which the Foley accounts particularly refer, they yield much information on other works for which such detailed papers have not yet come to light and, with the help of supplementary manuscripts and published material, it has been possible to make a fair appraisal of the pattern of the iron trade in about 1700.[3] Information on one important iron manufacturing region, south Yorkshire, is lacking in the Foley MSS. but accounts of several works in this district have been brought together in Bradford at Cartwright Hall.[4] Although not compiled with the same attention to detail, they fill an otherwise serious gap. The account which follows provides a reasonably comprehensive picture of the iron trade in the Midlands and in the adjacent areas of the Forest of Dean, south Yorkshire, Derby and Nottingham. For the rest of the country, notably for south Wales and the Weald, the evidence is less adequate.

The 1717 list of furnaces and forges appears to be substantially accurate in the light of the Foley accounts and provides an invaluable scale against which to gauge the extent to which the works concerned in them may be taken as representative of the whole industry. Figure 1 shows the distribution of works enumerated in the 1717 list. The close correlation of furnaces with the occurrence of iron ores is at once apparent; Coal Measure ironstones were the most widespread basis for the industry, except in the Forest of Dean and north Lancashire, where hæmatite ores of the Carboniferous limestone were important, and in south-east England, where ironstones in the Wealden Series were used. This general pattern of blast-furnace distribution was to

[1] E. W. Hulme, "Statistical history of the iron trade," *Newcomen Soc. Trans.* 10 (1929–30) 16.

[2] Hereafter referred to as the Foley MSS. The writer is indebted to Major H. T. H. Foley, M.B.E., J.P., of Hereford for enabling this research to be carried out.

[3] Among important published sources are: E. Straker, 'Wealden iron' (1931); A. Fell, 'Early iron industry of Furness and district' (1908).

[4] The Cartwright MSS. have received the attention of economic historians. See Raistrick and Allen, "South Yorkshire ironmasters, 1690–1750," *Economic Hist. Rev.* 9 (1938) and A. Raistrick, "The south Yorkshire iron industry," *Newcomen Soc. Trans.* 19 (1928–9).

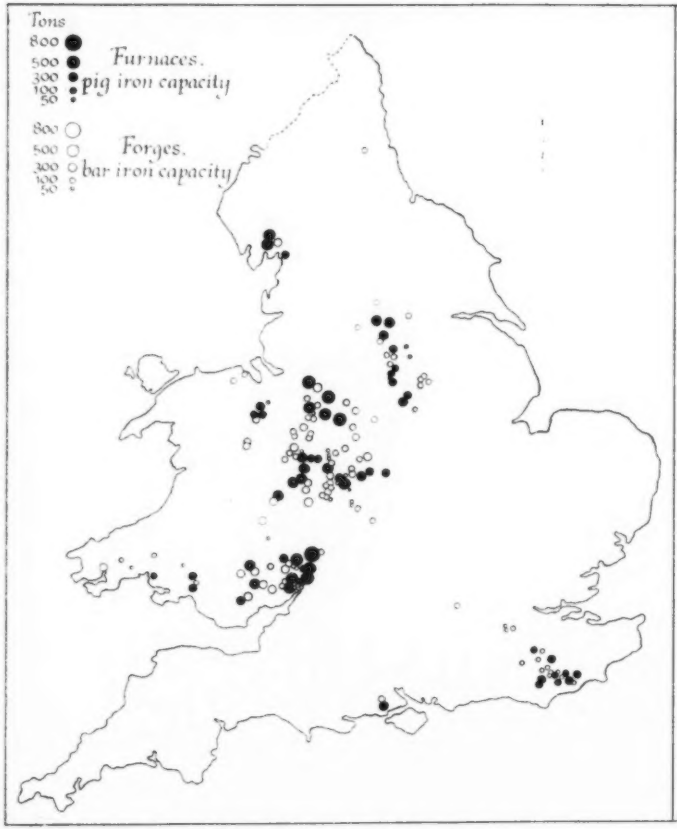


Fig. 1. Iron furnaces and forges, 1717

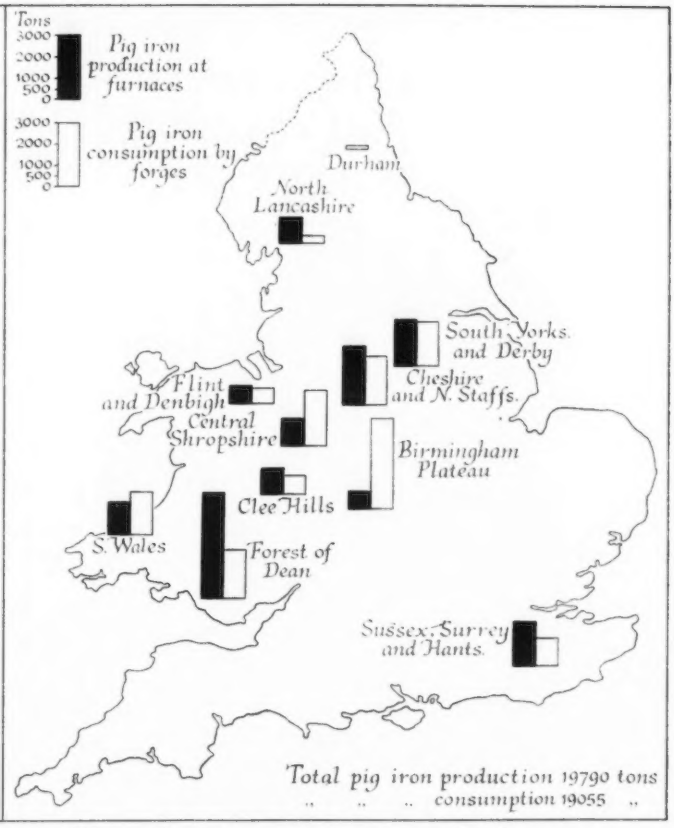


Fig. 2. Production and consumption of pig iron, 1717

change little over the next century and a half, until indeed the Jurassic ores came into use, although the relative importance of the districts changed and the ores of the north-eastern coalfield became the basis of an important smelting industry. Only one of the furnaces shown appears to have obtained the bulk of its ore from a distance; this was Vale Royal in Cheshire, which was sited to obtain "Cumberland Ore" by sea from Furness and Whitehaven. In no other instance was a furnace more than eight or nine miles from its source of ore, and in most cases the distance was much less.

The furnaces have been grouped regionally in Figure 2 on the basis of their sources of iron ore. The forges have been placed in the same major groups as the furnaces, though in several cases the inclusion of a forge in one region or another was arbitrary. The capacity of forges to make bar iron (as given in the 1717 list) has been converted to their capacity to consume pig iron in order to arrive at comparable data.[1] Two main conclusions may be deduced from Figure 2. It appears probable that, for the country as a whole, pig production and consumption were about balanced. The import of pig iron from the American colonies had not yet begun, while the import through Hull of Continental iron for such forges as Staveley and Carburton did not amount to any appreciable total. Secondly, significant discrepancies existed in several regions between the pig producing and consuming capacities of the furnaces and forges respectively. The most striking surpluses of pig iron were in the Forest of Dean and north Lancashire, both of them producing high quality "tough" pig iron from hæmatite ores with a low phosphorus content. Outstanding among the regions deficient in pig iron production was the Birmingham Plateau, though central Shropshire and south Wales were also a long way from being able to satisfy their own requirements. The convenient position of these regions for the export or import of pig iron, by sea or along the Severn, was undoubtedly a great encouragement to trade though, as will be shown below, it was not its fundamental cause.

It must not be assumed that the existence of a surplus of pig iron over forge capacity necessarily meant that the surplus was available for export to forges elsewhere. A proportion of furnace output was in the form of castings such as firebacks, pots and other domestic articles, guns and shot, and heavy hammers and anvils for forge use. The Wealden district was particularly famous for naval and other castings, and possibly all its apparent surplus of pig was usually absorbed by these goods.

The products of the blast furnace, tied as the latter was to its sources of iron ore, entered into long-distance trade much more than did bar or rod iron; the forges and slitting mills, making bar and rod respectively, tended to be near their markets. The heaviest traffic in pig iron was certainly on the Severn, between the Forest of Dean furnaces and the forges of the Birmingham region. For some years at the beginning of the eighteenth century a single partnership controlled 70 per cent. of the pig iron output of the Forest of Dean, and annually despatched some thousand tons of tough pig iron to forges on the Worcestershire Stour, via Bewdley and its embryonic rival at the confluence of Stour and Severn, later to become Stourport. This quantity

[1] From numerous entries in the accounts the average weight of pig iron taken to make one ton of bar was 28 cwt.

represented 40 per cent. of the total pig iron deficiency of the Birmingham region. Other Forest furnaces are known to have contributed to the trade, but relatively little pig iron came into the Birmingham region from the north, either overland from north Staffordshire, or by the Severn from central Shropshire. The explanation of the overwhelming predominance of the Forest of Dean pig iron in the imports into this region lies in the quality of the pig. Forest pig was "tough," and suited to the manufacture of the best merchant bar iron; pig made from Coal Measure ironstones was of the much poorer "coldshort" quality,[1] due largely to the higher proportion of phosphorus in these ores. While the Birmingham and central Shropshire regions were practically self sufficient in respect of "coldshort" pig, they were unable to make the "tough" metal required both for refining into merchant bar for the best wrought ironwork, and for blending with "coldshort" pig in the refinery to make bar of intermediate and lower quality for nailers and other smiths.

The forges of the north Midlands and south Yorkshire were poorly situated to obtain tough pig iron, and could only do so at the considerable expense of carting it overland from the Severn river ports, such as Bewdley, from Vale Royal furnace near the mouth of the Weaver in Cheshire, or over the Pennines from north Lancashire. Forest of Dean tough pig penetrated, via Bewdley, as far north as Consall forge in north Staffordshire, though only in small quantities. Tough pig made at Vale Royal, from Cumberland ore with a small admixture of north Staffordshire ironstone, was used principally at the Cheshire forges of Cranage, Warmingham and Lea, and also at Bodfari Forge in Denbighshire to which it was sent a large part of the way by water from Frodsham or Chester, through Mostyn. Again, only small consignments travelled farther afield into Staffordshire and Yorkshire.

With a relatively small local production of bar iron to absorb their output, the Lancashire smelters appear to have relied mainly upon coastwise and river trade for the disposal of their surplus tough pig. Bodfari forge used Lancashire pig on occasion, as no doubt did Holywell forge, and it was used to supplement Forest of Dean pig in the forges of south Wales, and even in the Birmingham region. Figure 3 summarizes the trade in tough pig iron and also indicates the restricted traffic in iron ore, while Figure 4 shows the more limited extent of the inter-regional trade in coldshort pig iron.

With the important exception of Vale Royal, traffic in iron ore between one region and another was on a very small scale, and involved only the high quality hæmatite ores and "cinders."[2] The Lawton and Mearheath

[1] "Coldshort" iron tended to be brittle when cold in contrast to "tough" iron. It was however suitable for making castings and nail rods. Not all iron made from Coal Measure ores was referred to as coldshort. In some cases, coldshort indicated the poorest quality, the term "ordinary" being used for the normal run of metal other than "tough"; the distinction was a fine one rarely reflected in the price of iron. In the present paper "coldshort" is used in the wider relative sense.

[2] Cinders were the slaggy residue of the bloomeries used before the introduction of blast furnaces. Only part of the metallic iron in the ore could be extracted at the low temperature of a bloomery hearth and the residue contained as much as 60 per cent. of iron. See Rhys Jenkins, "Forest of Dean iron industry," *Newcomen Soc. Trans.* 6 (1925–6).

furnaces, near the Cheshire–Staffordshire border, imported Furness ores from time to time through Vale Royal, but relied heavily upon the local Coal Measure ores for the bulk of their requirements. Lawton smelted a mixture of the imported and local ore to produce what was termed "mixed" pig, intermediate in quality and price between tough and coldshort, but this practice does not seem to have been widespread. Lancashire ore also found

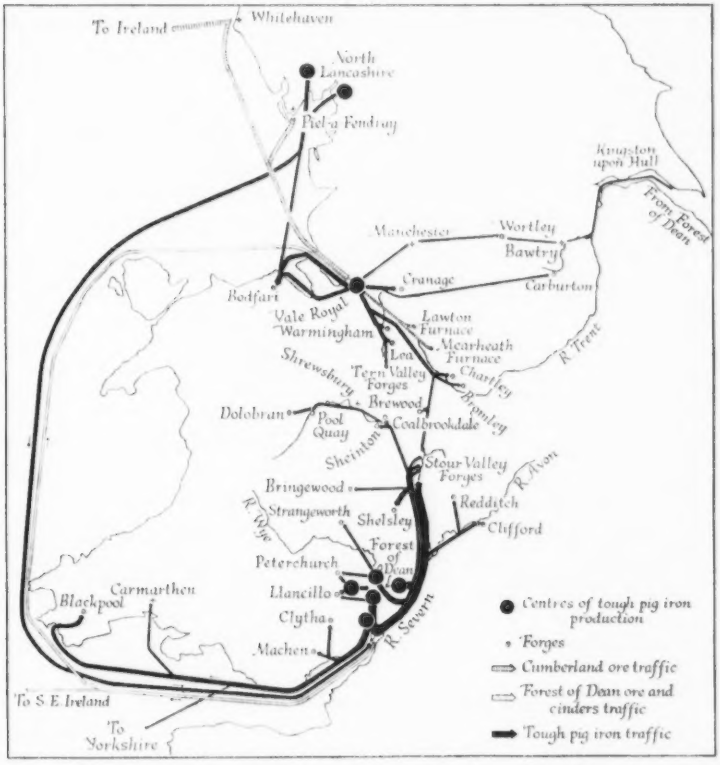


Fig. 3. Production and trade in tough pig iron in the early eighteenth century

a market in certain of the Forest of Dean furnaces in the 1720's, but not on an important scale. Particularly in and around the Forest of Dean, cinders, as a source of high-grade iron, constituted a larger part of the furnace charge than did the local ore. Cinders were shipped from the lower Wye and the north shore of the Severn estuary to Vale Royal and up the Severn to Shropshire, and both cinders and ore were despatched to Wicklow and Wexford whence came Irish bar as a return cargo.[1]

Dependent upon the Wealden ironstones, the Sussex and Kent furnaces

[1] Public Record Office. Port Books of Cardiff, Swansea and Chepstow, 1695–6, etc.

produced pig similar to that made from Coal Measure ores, though as has been suggested, a larger proportion of the output was in special castings than was the case elsewhere. Straker's 'Wealden iron' contains a wealth of information on these castings, but little is available on the pattern of trade at the period now in question. Among the Foley concerns however, Ashburnham furnace and forge figured for a short time and it is clear that the London market took considerable quantities of plates and other castings, while some pig iron was supplied to the Stour forges via Rye, Bristol and the Severn.

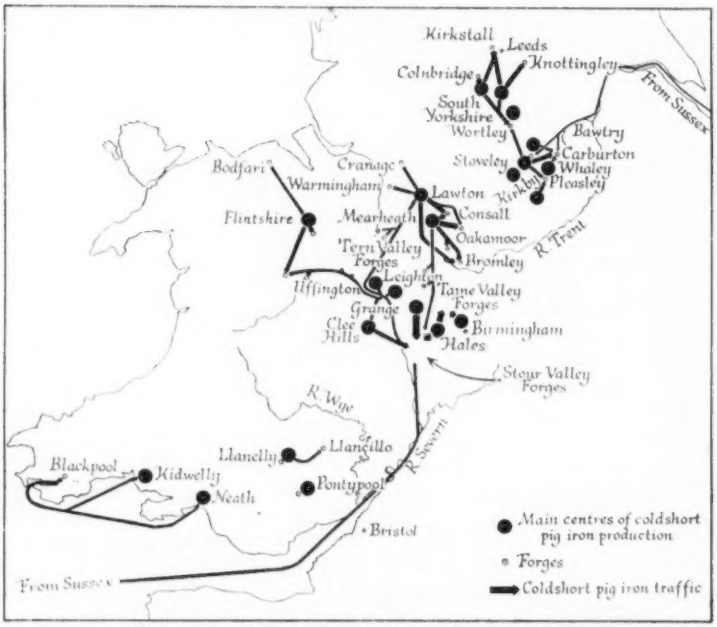


Fig. 4. Production and trade in coldshort pig iron

The fact that a partnership with predominantly west Midland interests was in possession of the Ashburnham works may indicate that the trade with the Stour valley was exceptional, as Wealden pig iron was hardly of the quality to command so distant a market under normal conditions.

In one specialized branch of production coldshort iron was preferred to tough, probably for the reason that it was not so malleable; coldshort iron was almost exclusively used for the manufacture of heavy hammers and anvils, the basic tools of the forges. Most forges used up some five tons of these castings annually, and in consequence a considerable trade existed independent of the traffic in pig iron proper, and to some extent in the reverse direction (Fig. 5). The Forest of Dean furnaces are notably absent from this

field of activity, and the forges of the region had to obtain hammers and anvils from elsewhere. The Grange and Hales furnaces in the Birmingham region specialized in such castings and served a widespread market, extending even into such areas as north Staffordshire, Cheshire and South Wales, which were themselves engaged in the trade. Whether any metallurgical superiority attached to the south Staffordshire product is not known for certain, but that south Staffordshire forge castings were held in high repute even in the nineteenth century is significant. Shropshire and north Wales furnaces also sent

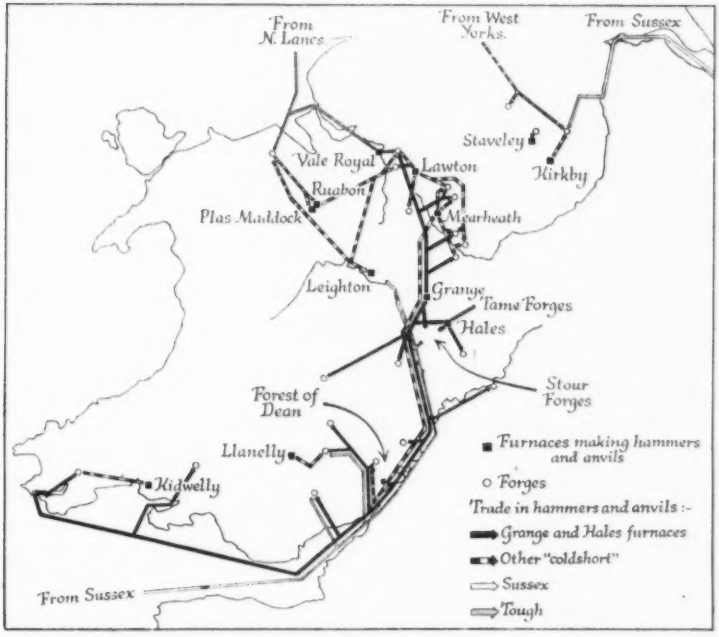


Fig. 5. Production and trade in forge hammers and anvils

hammers and anvils beyond their immediate neighbourhood, but only Sussex could compare with the Birmingham region in the extent of its markets. Besides supplying the forges of the south-east, Sussex hammers and anvils were despatched to Nottinghamshire (via London, Hull and Bawtry) and in significant quantities to the Forest of Dean, the Birmingham Plateau and central Shropshire. The Yorkshire forges obtained their requirements locally. While the Forest of Dean furnaces did not make forge castings, Vale Royal made tough hammers and anvils for Cranage and Bodfari forges; but it appears that these tough castings had to be "steeled" before use, presumably to render them less malleable and so more like coldshort castings.

How far the availability of charcoal influenced the regional distribution of

pig iron production at this period it is difficult to estimate; the evidence is fragmentary and to some extent capable of contradictory interpretations. Charcoal was by far the most expensive item in operating costs and constituted over 70 per cent. of the total costs of production at many furnaces. In both the Forest of Dean and in south Yorkshire,[1] coppice woods were cropped at intervals to maintain an even supply of charcoal timber for the ironworks, and it does not appear that the industry as a whole was, at this time, making any serious inroads into the country's woodland resources. It was important to the stability of the industry that regional demands for charcoal should not exceed the region's capacity to maintain supplies at a fairly constant level; being bulky in relation to its weight, and very liable to deterioration in transit, charcoal was not a commodity of inter-regional trade, even by water. By and large it would seem that the demands of furnaces, forges and other users were nicely adjusted to the local charcoal resources, though shortages did occasionally occur. Only rarely was the idleness of a furnace specifically attributed to a shortage of charcoal. A conscious attempt to adjust demand to supply is seen in the purchase, by a partnership which operated the Lawton and Vale Royal furnaces and the Cranage and Warmingham forges in Cheshire, of a furnace at Street in order to dismantle it and so safeguard the supplies of charcoal to their other works. "Street being only two miles from Lawton . . . and the woods in the country growing scarce, the intent of Thomas Hall taking this furnace was for the service of Lawton furnace."

Furnaces and forges competed for the charcoal resources of a district, and the proportion of smelting and refining units was no doubt determined by economic factors operating over a considerable length of time. In the Birmingham region the existence of a large local market for bar and rod iron, combined with the convenience of bringing tough pig iron up the Severn, swung the balance in favour of the forges. In the Forest of Dean it was more profitable to use most of the available charcoal for smelting the region's speciality, tough pig, than to use it in refining more pig iron for despatch as bar to distant markets.

The double process of refining pig iron in a "finery" forge and "drawing out" the resultant blooms into bar iron in a "chafery" forge was accompanied by a loss in weight of some 30 per cent. Such an appreciable wastage would appear from classic economic theory to encourage the location of forges close to their sources of pig iron. By water, the costs of transportation of pig iron and bar were similar, weight for weight, and it has been shown that most of the movement of pig was by sea or river. But it was only on land, and for distances of over twenty miles which pig iron rarely travelled, that the difference in costs in favour of pig iron became appreciable; transport costs therefore did little to reduce the attraction of sites near the furnaces, yet many forges were situated far from their main source of pig iron. Blackpool forge in Pembrokeshire, Clifford on the Warwickshire Stour, and Bodfari may be quoted as examples of forges using pig iron from one relatively distant source. Charcoal supplies may have been at least part of the initial attraction at Blackpool and Bodfari, for the local demand could absorb less

[1] A. Raistrick, *op. cit.*

than half their bar output, the remainder going by sea to more distant markets (Fig. 6). Clifford forge supplied a purely local market however, and here cheap charcoal possibly combined with the convenience of maintaining close contact with its customers to compensate for the greater expense of transporting the iron as pig. At Blackpool charcoal was certainly cheaper, though no more abundant than in the Forest of Dean,[1] and the difference in costs of production was sufficient to enable Blackpool, despite its distance from both sources of pig iron in the Forest and from its markets in Bristol

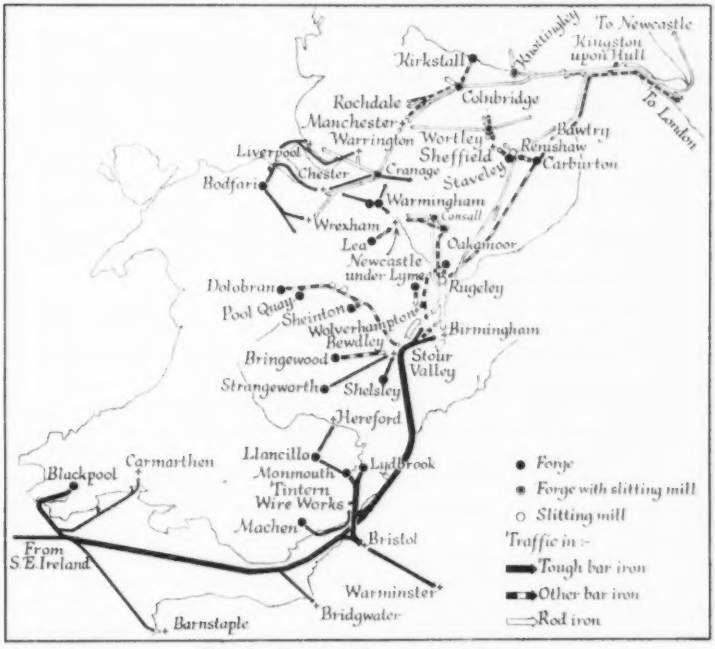


Fig. 6. Trade in bar and rod iron

and Bewdley, to compete on favourable terms with forges on the Wye which produced the same quality of bar iron for the same markets.

The dozen or more forges on the River Stour in Worcestershire and Staffordshire provide an illustration of the locational factors which operated where pig iron from more than one region was being used in different proportions to make various grades of bar iron. These forges were well placed to receive Forest of Dean pig via the Severn and coldshort pig either from

[1] At Blackpool charcoal costs varied between 22*s* 3*d* and 27*s* 0½*d*, per load of a dozen sacks, compared with a range of 30*s* 10½*d* to 38*s* 11¼*d* for three characteristic Forest of Dean works; yet, in a memorandum to the 1717 list of furnaces and forges, it is stated that the reduction in the forge's output (from an average of 200 tons per annum to 50 tons) was due to shortage of charcoal.

local furnaces or, via the Severn, from central Shropshire. (The contrast in transport charges between water and land was such that it cost little more to bring pig from some of the Forest furnaces to the Stour forges than it did to bring local pig from ten or twelve miles distant.) They were able therefore to manufacture the full range of types of bar iron in common use, and so to satisfy the varied demands of the Birmingham and south Staffordshire market. Furthermore, in this district at any rate, it had been found possible to use pit-coal in the "chafery" forge when bars of ordinary quality were being drawn out, with a consequent saving of about 7 per cent. in total costs. The slitting mills, to which went the greater part of the bar iron made in the Stour forges, used coal exclusively for reheating the bar iron and this fuel, obtainable so cheaply from the Thick Coal and other seams of south Staffordshire, was no doubt among the principal attractions for the numerous nailers and blacksmiths who formed the final market for both rod and bar iron. Generally speaking, slitting mills were situated close to the forges supplying them with bar although the wastage in slitting, amounting to barely 5 per cent., can hardly have been a major consideration. Forges and slitting mills were to some extent interdependent, and the presence in the Stour valley of a combination of factors favourable to both types of ironworks accounts for the unique concentration there of forges and mills.[1]

At most forges both finery and chafery processes were carried on, and bloom iron from the finery only entered into trade to a limited extent. It was probably the specialization of the Stour forges on coal-chafery work that attracted bloom iron from Shropshire and even from the Sussex forges. This trade meant a saving of charcoal in the Birmingham region, as the quality of blooms imported did not require their "drawing out" in a charcoal hearth. Cannock forge, one of the few engaged solely on chafery work, used blooms from several forges in Cheshire and north Staffordshire while, farther north still, the Staveley and Carburton forges received Sussex blooms via the Humber.

Bar iron was however the final product of most forges, and in almost every region the local market absorbed most of the bars. Compared with pig iron, the volume of long-distance traffic in bar iron was small (see Fig. 6) but forges on, or near to, navigable water could profitably serve a wider market. Thus Bodfari forge sent bar to Chester and Liverpool through Mostyn. Half the output of Blackpool forge went to local ironmongers and smiths, including no doubt the shipwrights and gunsmiths of the Haven ports, while the remainder was despatched by sea to Bideford, Bridgwater, Bristol and up the Severn to Bewdley. Bar from forges in Montgomery and Shropshire came down the Severn to the Birmingham region, which also drew upon supplies from the lower Wye and Teme valleys. The Wye forges also supplied bar to Bristol and, through that port, to Wiltshire. On the other side of the country, Carburton forge sent bar through the river port of Bawtry to Hull and thence to London. With the exception of the latter instance, the traffic was almost wholly in tough merchant bar. Where, as in the Midlands, mill bar of blended composition and intended for nearby slitting mills was the principal forge

[1] M. J. Wise and B. L. C. Johnson, "The changing regional pattern during the eighteenth century" in 'Birmingham and its regional setting,' 1950, p. 171, Figure 37.

product, the local demand was for rods and these were the more important article of trade.

This general pattern of the trade in rod iron can be deduced from the evidence of many accounts. In the north, Colnbridge mill was probably characteristic of others in the region in serving, in addition to local customers, a large market over the Pennines in Rochdale and Manchester and in exporting rods to London via Hull. While Cranage mill supplied Liverpool, Chester and market towns in the Cheshire Plain, the slitting mills, and indeed the whole iron industry of north Staffordshire, directed their energies to the manufacture of rod iron for Birmingham, Walsall, Wolverhampton, Stourbridge and other centres on or near the south Staffordshire coalfield. Part of the output of Renishaw mill in north-east Derbyshire travelled sixty miles overland to Wednesbury and Birmingham, and it is probable that other works in Nottinghamshire, under the direction of the Birmingham ironmaster, John Jennens, were engaged in similar traffic.

Whether one considers the trade in pig, bar, or rod iron, the Birmingham Plateau dominates the scene, exerting a strong centripetal attraction on the products of both neighbouring and more distant areas. The importance of its forges as consumers of pig iron from the Forest of Dean and elsewhere has been indicated, as has also the influence of its finished iron industries as the focal point for bar and rod iron from a number of sources. Within the region itself a distinction may be made between an inner zone of the finished or secondary iron trades, almost coincident with what was later to become the conurbation of Birmingham and the Black Country, and an outer zone of forges, slitting mills and a few furnaces on the centrifugal streams of the Plateau—the Stour, Smestow, Tame, Penk and Arrow. These latter represented, in the main, the end processes of the basic iron industry of the period; they produced the bulk of the bar and rod iron required by the inner zone but were supplemented by the products of yet a third zone, the Welsh Border country and the Forest of Dean supplying bar iron and north Staffordshire, Derby and Nottinghamshire supplying rod. The Birmingham region was to maintain this dominating position as far as the forge iron industry was concerned, despite many technical changes, well into the nineteenth century, until indeed cheap steel eventually replaced wrought iron in many fields.

This article is based on a paper read to the British Association, Section E, at Birmingham in August 1950.

AN UNDESCRIBED MANUSCRIPT COPY OF INŌ CHŪKEI'S MAP OF JAPAN

NORMAN PYE AND W. G. BEASLEY

AFTER NEARLY a century of extensive trade and communication with foreigners Japan, under Iemitsu, the third Tokugawa shōgun who ruled from 1623 to 1651, closed its doors to aliens. The edicts issued by Iemitsu, especially in and shortly after 1636, prohibited all traffic with the outside world and restricted Japan's foreign intercourse to the small Dutch factory on Deshima island in Nagasaki Bay and the few Chinese junks allowed to visit that port. For over 200 years thereafter Japan remained a closed country. In the early part of this period only the maps made by the Jesuit fathers in the seventeenth century were available, and no accurate maps of all Japan existed or had ever been made.[1] The problem of the portrayal of the northern islands of the Japanese archipelago was one of the great cartographic puzzles of the Pacific. For more than two centuries the true nature of the lands north of Honshū remained a mystery, and it was not until 1787 that La Perouse solved one of the problems connected with the island of Ezo (Yezo; now Hokkaidō) by proving its separation from Sakhalin. This work was supplemented in 1797 by Captain W. R. Broughton's discovery of the strait to the south of Ezo. Not until the nineteenth century was Ezo known by western cartographers to be an island.

It was at this time that Inō Chūkei (Inō Tadataka, 1745–1821) established a landmark in the history of Japanese cartography by his survey of the whole of Japan, accomplished between 1800 and 1816. The first to be based on a system of triangulation of prominent hills and topographical features, and strengthened by 1135 determinations of latitude and longitude, it was an enormous advance on any previous map of that country. Indeed it achieved such an impressive degree of accuracy that even the maps published in 1866 by the Military Land Survey Department on the scale 1 : 200,000 had much of their coastlines derived from Inō's survey.

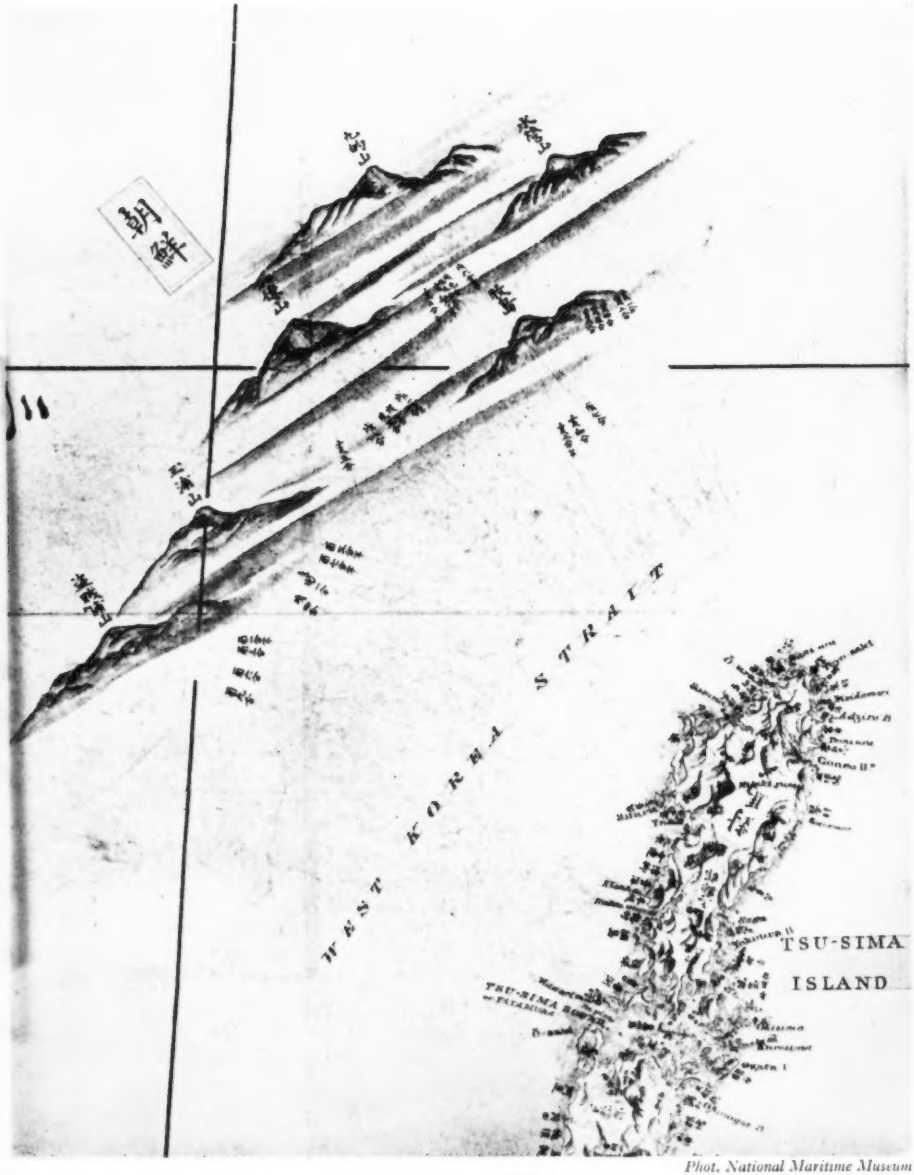
Brief summaries of the life and work of this indefatigable surveyor were published by Dr. E. B. Knobel in the *Geographical Journal* (42 (1913) 246–50), and by Cargill G. Knott in the *Transactions of the Asiatic Society of Japan* (15 (1887) 173–8). A more substantial and authoritative account of Inō's life and an exhaustive exposition of his surveying technique and equipment has been published by Otani Ryokichi in his book 'Tadataka Inō, the Japanese land surveyor' (translated by Sugimura Kazui, Tōkyō, 1932) but the essential facts about the initiation and progress of his mapping of Japan, sufficient for an appreciation of the manuscript map here described, can be briefly summarized.

It was only after a successful commercial career as a brewer and rice and

[1] See G. Kiss, The cartography of Japan during the Middle Tokugawa Era: a study in cross-cultural influence," *Annals Assoc. Amer. Geographers*, 37 (1947) 101–19.

Phot. National Maritime Museum

1. Part of the west coast of Honshu



Phot. National Maritime Museum

2. Tsushima and Korea

firewood dealer that Inō Chūkei could afford to develop his interest in astronomy and surveying and in 1795, at the age of fifty, he began to study surveying under Takahashi Sakuzaemon, a noted scholar employed in the Calendar Office and the Astronomical Observatory at Edo (Yedo; now Tōkyō). His opportunity for useful field work came some five years later when the attacks of marauders from Siberia on one of the Kurile Islands nearest to Ezo provided good reason for mapping the coasts of the island; the boundary between Japan and Russia was rather vague and maps would be necessary for planning the defence of the country and for a policy of colonization. It seems certain however that while the incursions offered a suitable excuse there were several other important motives for undertaking the survey. Takahashi was anxious to determine accurately the length of a degree of latitude for use in his astronomical observations, and this could be done only by accurate observations over long distances, such as would be afforded in a survey of Ezo. Inō's personal motives were a desire to use the instruments he had had constructed for astronomical purposes and also to win a reputation from such an unprecedented enterprise.

That no adequate map of Japan had been made before 1800 is to be explained partly by the impossibility of making a survey of the estates of the feudal lords, except by order of the Shōgun, and partly because ordinary land surveyors, though they could map areas so small that they might be considered a plane, were unable to employ astronomical observations for latitude and longitude to control the errors that accumulated in more extensive surveys. Inō not only possessed precise instruments and a good knowledge of field astronomy and surveying, but also came forward just when a large survey was urgently needed by the Shōgunate, and it was with this support that he embarked upon his task in June 1800.

The island of Ezo was inhabited only by Ainos engaged in fishing and by the Shōgun's officials in the scattered coastal stations; roads were rough and so frequently had Inō to rely on river routes that the survey by distance and azimuth became less accurate than anticipated. He surveyed the south-east coast from Hakodate to Nemuro and roughly determined the position of the capes of the island of Kunajiri by observing their azimuths from points near Nemuro at the eastern end of the island of Ezo. This survey lasted from June until November 1800 and in the course of it Inō chanced to meet a petty official, Mamiya Rinzō; this led Mamiya Rinzō to practice astronomical observations and land surveying under Inō and the work he was able to do in Ezo several years later was to prove valuable as a supplement to Inō's own survey.

On the results achieved in Ezo, Takahashi successfully recommended Inō to the government for the undertaking of a complete survey of Japan, and in May 1801 he began work on the eastern coast of the main island. By January 1802 he had covered the ground from Shimoda to the Tsugaru Straits and, the government having consented to a continuation of the work, he began the survey of the coast and hinterland of the Japan Sea in July 1802. By November of the same year he had mapped the coast and highways between Aomori and Naoetsu. In April 1803 he left Edo to complete the remaining part of the coast, surveying westward to Nagoya and then along the highway to

Tsuruga. From Tsuruga they surveyed westwards as far as Wakasa Bay and then east to join with their former season's work at Naoetsu. The survey of the island of Sado, and of the highways on the return to Edo, completed the work in the eastern half of the main island in November 1803.

The map of the eastern half of the main island, compiled from these surveys, was submitted to the Shōgun in September 1804; Inō's ability in surveying was demonstrated, and so clear was the value of this detailed topographical map for the assessment of communications by land and sea, that in recognition of his services Inō was appointed an official and given a commission to survey western Japan. This task lasted from March 1805 to July 1814, with intervals spent in Edo to reduce the survey materials and plot them in map form. During that time the coasts of the main island, the islands of Shikoku, Kyūshū and the maze of adjoining islands as far as Tsushima in the west and Yakushima and Tanegashima in the south, together with many adjoining highways were surveyed.

The survey of Japan was completed between June 1815 and May 1816 by the inclusion of the islands scattered to the south of Izu (the Izu-shichitō of "seven islands of Izu") and the mapping of some minor highways in the adjacent region of the mainland. Inō, being then seventy years old, sent officials and pupils to carry out the field work and superintended the survey from his home in Edo, where he was meanwhile engaged in a town survey.

The region Inō had desired to survey before any other was Ezo, and, after making a rough survey of the south-east coast of that island in the first year of his geodetic career, he had constantly been obliged to postpone the survey of the whole coast because of the Shōgun's commands to map other areas. Mamiya Rinzō however, the Ezo official who had become one of his pupils, carried out a regular coast survey of the island some time between 1812 and 1816.

After the completion of the field work in 1816, Inō began the task of compiling a map of Japan. Although his health was failing he was able to supervise the work until within a few months of his death, at the age of seventy-three, in May 1818. The drawing of the map and its smaller scale derivatives on 1 : 216,000 and 1 : 432,000 was completed by his pupils and assistants in the summer of 1821 and the official presentation was made in August of that year. It was only at the end of September, when the presentation of the series of maps of the whole country was over, that Inō's death was formally announced.

It has long been considered that this remarkable map is only available to us in this country through the copies published by von Siebold of the maps he succeeded in carrying with him when banished from Japan in 1830.[1] Dr. P. F. von Siebold arrived at Nagasaki in 1823, ostensibly as physician to the Dutch factory at Deshima, but in fact to gather information about Japan for the Governor-General in Batavia. During his seven-years residence there he acquired from Takahashi Sakuzaemon, astronomer to the Shōgun, copies of some of the smaller scale maps prepared from the Inō survey in exchange for a recent Russian map of the world. This transaction was a contravention of the seclusion laws—though not the first of its kind—and as such was betrayed to the Japanese officials. For his part in the affair Siebold was banished from

[1] See Murdoch, 'History of Japan,' III, 555–8.

the country, after being forced to surrender the maps he had received from Takahashi. He did succeed however in smuggling out his own copies of these maps in 1830, and later published them in 'Nippon, Archiv zur Beschriebung von Japan,' text and atlas (Leyden, 1832–54). The copy of this edition of the book in the British Museum is bound in 3 volumes of text and 7 volumes of maps and plates; that in the India Office library in 1 volume of text and 1 volume of maps and plates. In each case the volumes of plates appear to incorporate some or all of the maps published by Siebold in 1851 under the title 'Atlas von Land- und Seekarten vom Japanischen Reich,' though no separate copy of this work has been found in London. In the library of the Royal Geographical Society is an engraved facsimile of the original MS. maps, done in Sino-Japanese characters and published by Siebold in 1841 under the title 'Map of the Japanese Empire from the original maps and astronomical observations of the Japanese.' The name of Inō Chūkei does not appear on it and Siebold credited it to Takahashi, an error repeated by Count Teleki in his work on Japanese cartography.

It seems quite certain however, from evidence concerning the circumstances of its acquisition, that a very large manuscript map of Japan (the three sheets comprising the map, the northern, eastern and south-western, measure 5 feet 5 inches by 8 feet 6 inches, 5 feet 5 inches by 6 feet 1 inch, and 5 feet 5 inches by 6 feet 11 inches respectively), formerly in the archives of the Hydrographic Department of the Admiralty,[1] and now on permanent loan to the National Maritime Museum at Greenwich (H 1658/1936), is a first-hand copy of the smaller scale map produced from Inō's original great survey. It is without signature or title, and it therefore seems worth recording its history and the evidence that establishes its distinct historical value as one of the very earliest maps of Japan which had any approach to accuracy. Its interest for specialists in oriental studies is enhanced by its being the only copy known to exist outside Japan.

The entry in the original documents catalogue of the Chart Branch of the Hydrographic Department records that the maps were received in that department on 11 April 1864 from H.M. Ships *Actaeon* and *Dove*. The labels on the backs of the maps state that they were presented by the Japanese government to the British Minister Plenipotentiary in Japan, Sir Rutherford Alcock, and this is borne out both by Foreign Office records and Japanese accounts. In May 1861 Alcock visited Nagasaki, where he found H.M.S. *Actaeon* and three gunboats, newly arrived in Japan to undertake surveys in accordance with arrangements he had made in the previous year. He asked the Japanese to provide them with all necessary facilities, including interpreters,[2] and then returned overland to Edo, while the surveying squadron proceeded to Kanagawa in Edo Bay to await Japanese permission to begin the immediate task of surveying the coast southward to Nagasaki. This was

[1] Original Document number D $\frac{8428}{1-3}$ 48b.

[2] Foreign Office, *Embassy and Consular Archives, Japan* (F.O. 262), vol. 465, Myburgh (Actg. Japanese Sec.) to Japanese For. Min., Edo, 6 June 1861. The *Actaeon's* log, preserved in the Public Record Office (reference Admiralty, Ships' Logs (Adm. 53) 7293) records Alcock's visit under dates 24 and 27 May 1861.

not finally arranged until early August. The Japanese government was well aware that anti-foreign feeling ran high in many of the coastal districts to be visited by the surveyors and insisted that the ships be accompanied by Japanese officials, not only to act as interpreters, but also to prevent, if possible, any clash with local lords and their retainers.[1] This was agreed, and officials were appointed to serve on each of the four ships. They took with them a copy, in three sheets, of the smallest of the maps prepared from Inō's survey,[2] and this inevitably attracted the attention of Commander Ward, the captain of H.M.S. *Actaeon*. Realizing that these maps could be of considerable value to him, he obtained from the Japanese on board a letter to their colleagues in Edo which would enable him to identify the maps, and returned in one of the gunboats to interview Alcock. On 24 August 1861 Alcock requested the Japanese government to provide him with a copy of the three sheets Ward had seen. The commander, he wrote, "has carefully compared these with some of his own surveys and although they have been made without our instruments and astronomical observations he is delighted to find they are so accurate that they may be trusted and thus avoid many of the difficulties Your Excellencies feared might result."[3] The latter was an argument well calculated to overcome the Japanese government's reluctance to part with maps of its coastline, a reluctance which had been reported by Alcock only a week earlier when he had sent another map of Japan to the Foreign Office, together with a good deal of political information, all of which he said had been "most difficult to obtain . . . though most of it was in print under official sanction."[4] Alcock's persuasions succeeded and the maps were handed over. The squadron occupied itself thereafter with the work of supplementing them with navigational data, but there was little prospect of further detailed work in 1861 for the surveying season would end in October with the beginning of the northerly monsoon. Moreover, in September, the Japanese urgently requested that part of the survey be abandoned on political grounds, offering to complete it themselves if necessary. To this Alcock felt compelled to agree.[5] Taken in conjunction with the proven accuracy of the Inō survey, this request sufficiently explains why the coastline of the chart produced by the Admiralty (Chart No. 2347, published 15 May 1863), a copy of which is preserved in the archives of the Hydrographic Department, was

[1] See especially F.O. 262/465, Alcock to Japanese For. Min., No. 60, Edo, 6 August 1861, in which he states and accedes to the Japanese request; and F.O. 262/464, Japanese authorities to Alcock (8 August 1861), making the final arrangements.

[2] The identification of the map carried by the Japanese officials is made by Otani Ryokichi, *op. cit.*, p. 151, whose account substantially confirms the story of events given here from British sources.

[3] F.O. 262/465, Alcock to Japanese For. Min., No. 67, Edo, 24 August 1861. There is no copy in the Foreign Office records of the Japanese letter identifying the maps. See also the short account of the incident given by Captain W. Blakeney, 'On the coasts of Cathay and Cipango forty years ago' (London, 1902), p. 284.

[4] See F.O. *General Correspondence, Japan* (F.O. 46), vol. 13, Alcock to For. Off., Confidential, Edo, 16 August 1861. This map, 56 inches by 28 inches, printed in Edo in 1849, is now in the Public Record Office (reference M.R. 376). Clearly designed as a map of communications it is very much cruder than the map obtained for the *Actaeon*.

[5] See F.O. 262/36, Alcock to Naval S.O. in Japan, No. 68, Edo, 24 September 1861.

based on that of the Japanese map. The MS. maps at Greenwich still bear the pencil "squaring" by which detail was copied on reduced scale from the sinusoidal graticule of the maps to the Mercator projection of the chart.

It was thought by Dr. Knobel that the manuscript in the Hydrographic Department might be by Inō Chūkei himself.[1] The researches of Otani Ryokichi (*op. cit.*) show however that the small-scale map cannot have been drawn by Inō's own hand, since even the earlier large-scale compilation, derived directly from the thirty-three sheets of maps produced from his surveys, was not completed until after his death. But it is undoubtedly one of the first-hand copies produced from the original. The first maps, covering the whole of Japan on a scale of 1 : 30,060, were drawn by using the entire survey materials resulting from the continuous field-work carried out by Inō and his assistants between 1800 and 1816 in Ezo, Honshū, Kyūshū and Shikoku, together with Mamiya Rinzō's surveys of Ezo. Undertaken by Inō in his last years, it has been noted above that they were completed by his assistants and pupils more than three years after his death.

From this original compilation a map of the whole of Japan was produced in three sheets on the reduced scale of 1 : 216,000 and from this in turn a smaller map was produced on the scale of 1 : 432,000. The originals of these derivatives were kept by the Shōgunate and the Inō family but were destroyed by fire and earthquake in 1873 and 1923 respectively. A copy formerly in the possession of an astronomer of the Shōgunate was reported to be preserved elsewhere in 1932, but nothing is known of its present whereabouts. Otani states that as "this map proved of much practical use in navigation before and after the Meiji Restoration a number of far-sighted men of different clans copied it," and consequently several such copies were reported to be extant in Japan in the second half of the nineteenth century.[2] Before the Second World War, accident and natural disaster had led to the loss of many of the manuscript copies deposited in various parts of Japan. Recent information, kindly supplied by the officials of the Diet and Cabinet Libraries in Tōkyō, is that although the exact number of copies of the map still extant is not known there can be only very few.

The graticule on which the map is drawn is clearly a sinusoidal projection centred on the meridian of Kyōto. Meridians and parallels are drawn at intervals of one degree, and along the central meridian the scale of the graticule is 9·9 inches to one degree of latitude (about 1 : 441,000). This scale is slightly smaller than the 1 : 432,000 on which Otani states the small scale map was produced, but the difference could easily be accounted for by paper shrinkage. Although measurements along each parallel reveal variations in the graduation, the plotting errors are generally small, being on the average about

[1] See Knobel's letter to the Hydrographer, Captain Douglas, 11 December 1913; deposited with Curator, Chart Branch, Hydrographic Department, Admiralty.

[2] Otani, *op. cit.*, pp. 345–6. It is doubtful whether the map was ever reproduced in its original form. It was engraved, but with modifications, and printed by the Kaiseisho about 1867. Ijima Hanjirō later published a complete geography of Japan (*Nihon Chiri Zenshi*, Tōkyō, 1876) in the maps of which the coasts were based on the Inō maps and inland areas on various prefectural surveys.

0·05 inch different from the correct value computed for a simple sinusoidal projection of the sphere with 9·9 inches to one degree of latitude (see Table).

Discrepancies in the length of a degree of longitude on Inō's graticule

Latitude	*Discrepancy (in inches)*	*Latitude*	*Discrepancy (in inches)*
30°	+0·03	39°	+0·06
31	+0·06	40	+0·02
32	+0·10	41	+0·03 to +0·08
33	+0·05 to +0·10	42	−0·01 to +0·04
34	+0·05 to +0·09	43	−0·04 to +0·06
35	+0·04	44	+0·02 to +0·03
36	−0·01 to +0·04	45	nil
37	−0·01 to +0·04	46	+0·02
38	+0·05		

The latitudes of places over the greater part of Japan show a remarkable accuracy. Between 30° N. and 43° N., the latitudes in Inō's map are indistinguishable from the modern values, and even in the region of maximum discrepancy, in the north of Ezo, north of 44° N., the latitudinal values are too small by only four minutes.

Despite the greater observational difficulties involved in the determination of longitude, there is an impressive accuracy in longitudinal values in the southern half of Japan. Here the only significant discrepancy between Inō's and modern values is to be found in the distant off-shore island of Hachijoshima which has a difference in longitude from the meridian of Kyōto some thirteen minutes too small. In the northern half of Honshū and Ezo, the differences in longitude between places on the same parallel are generally very good, but there is however a noticeable error in the absolute values of longitudes referred to the Kyōto meridian, the discrepancies increasing with latitude. Thus, whereas at latitude 36° N. the longitudinal errors are negligible, at 37° N. longitudes are shown some six minutes too far to the East. At 38° N., 39° N., 40° N., 41° N., 42° N., 43° N. and 44° N. the longitudinal values have Eastings too great by 11′, 12′, 15′, 23′, 40′, 42′ and 48′ respectively, and at the extreme northern end of Ezo, latitude $45\frac{1}{2}$° N., the error is 54′.

Accessibility was undoubtedly of the greatest importance in deciding the detail in which the several parts of Japan were surveyed; thus the coastline and its hinterland were continuously and well mapped, whereas inland the relief features, settlements and other topographical details are richest along the roads. Regional differences in the amount of detail owe something also to the changed circumstances under which different parts of the work were carried out. Thus the survey of the eastern part had been made by Inō as a lordless *samurai*, and in a comparatively short time, whereas the western part was surveyed after he had been appointed an official of the Shōgunate and was able, because of the various facilities he was given and the amount of time expended, to survey in greater detail.

Hills are shown in green with a transition to brown for the higher parts of

the loftier mountains. The hills are mostly depicted in profile, a dark green being used for the outline and the shading added to give a solid effect. In some cases there is an interesting attempt to combine the correct map position of the summit with an oblique hill shading, so disposed around the lower slopes as to suggest a perspective sketch of the mountain as seen from a particular direction. A light, unobtrusive, brown wash is used to strengthen the valley routes, and there is a pale green wash over unmapped areas. Differences in the style of hill drawing indicate the work of at least three draughtsmen. It is interesting to note that the hills round the coast are drawn as if seen from the coast; those flanking the roads are drawn as seen from the road when travelling inland from the coast. The result of this convention is that when routes meet from opposite directions, the low oblique views of the hills are inverted with respect to each other. It is understandable that the island of Ezo provides the largest area of unmapped land. Two traverses across the island at the narrower parts, marked by the modern Volcano Bay and the Ishikari valley, provide topography in their neighbourhood; round the coast the relief features are continuously surveyed. For the rest however only such peaks as Oakan, Meakan, Tsuhari, Shiribetsu, Shibetsu and Mombetsu are marked.

In all areas on the map which are not traversed by road it seems that only those hills are shown which can be seen from great distances, and could therefore be fixed by intersection during the route traverses. The abundance of azimuth rays (drawn in red) from various points on the roads to the prominent peaks is indeed a notable feature of the map. Direction notes attached to each ray, giving the value of the azimuth, indicate quite clearly that these are fixing rays giving a series of intersections on features during the course of the route traverses. The bearings of the rays are quoted as true bearings in "parts," to the nearest half part (Fig. 1). The compass roses on the map are divided into 12 main divisions with further subdivisions to give a compass with 24 points. Each 30° interval is the equivalent of 10 parts, so that a "part" is equal to 3°. The compass roses are set around the map away from the land areas, but the obliquity of the intersections of meridians and parallels away from the central meridian in a sinusoidal projection seems not to have been appreciated. The same survey technique seems to have been used for fixing the positions of other inaccessible sites. To the north-west of the Tsushima Islands, for example, there are views of mountains whose positions are obviously fixed by intersections of rays from different points on coasts of the islands; these mountains are on the mainland of Korea, but since the Korean coastline is not visible from the Tsushima Islands only the observed features were included in the map (Plate 2). This accurate portrayal of only that which is certainly known is in keeping with the scientific basis underlying and inspiring the whole of the work.

The cartographic conventions for other features, natural and cultural, may be summarized briefly. The surveyed route is drawn in red as also is the coastline, which has in addition a blue band about $\frac{1}{4}$ inch wide, and sandy coasts are further distinguished by a yellow backing to the red line; cliffs are shown by brown hachures and a rocky foreshore is indicated by dark brown lining. Lakes and rivers are shown in blue. All lettering is in black and

includes the names of provinces, towns, harbours, villages, directional notes on the azimuth rays and the names of features such as mountains, rivers, capes and bays. At some time subsequent to the receipt of the maps in 1864 some of the Japanese names have been transliterated in the Hydrographic Department.

The map has no explanatory legend and, although the meanings of certain symbols can be understood with certainty, there are others which cannot be so surely interpreted from their context. There is, fortunately, however a supplementary source of information. The Cabinet Library (*Naikaku Bunko*) in Tōkyō contains one of the few remaining first-hand copies of the smallest scale map derived from the Inō survey—indeed it is the only other copy besides that at Greenwich whose whereabouts are certainly known. Along one side of the sheet showing north-east Honshū has been stuck a strip of paper, apparently of the same type and period as that used for the map itself, which bears some notes signed by Inō Chūkei, including an explanation of the symbols used. These notes do not however appear to have been written originally for the map to which they are now attached and may have belonged to one of the sheets produced while the survey was in progress. Among others, the following symbols are listed: // provincial (*kuni*) boundary, ● district (*gun*) boundary, ○ military quarters (*jinya*), ○ post-station (*eki*). But inspection of the map shows that the symbols on it do not quite agree with this legend. Provincial boundaries are shown only where they cross the line taken by the surveyors, and are indicated by a single heavy stroke / in red at such points. The names of districts (*gun*) are given, but their boundaries are not shown at all. A close examination of the sheets failed to reveal any example of the use of the symbol ○, while the symbol ● is used in such a way as to indicate that it represents a post-station.

The map now at Greenwich and that in the Cabinet Library in Tōkyō appear to be identical. In each the same symbols are used, and in the same way. The one has however an explanatory legend presumably derived from a different map, the other has none at all, and for that reason it seems convenient to give here a revised legend which applies equally to both (Fig. 1). All the conventional signs are drawn in red.

Some of these terms require further explanation. In early nineteenth-century Japan, castle-towns were not so much military strongholds in the western sense, though some were that also, as the headquarters of the more important *daimyō* (feudal lords). Similarly the term *jinya* (military quarters) denotes usually the administrative centre of one of the less important fiefs. The post-stations (*eki*), also known as way stations, were points on the road where accommodation and other facilities were provided for officials, messengers and feudal lords travelling to and from the capital—very necessary in this period, when every *daimyō* was required to spend six months of the year in Edo.

A few comments may usefully be made on the historical value of the map. Because the detail is confined to the lines of the survey, that is to the roads and coastline, it gives a very clear picture of land communications but is of less help in determining the distribution of settlement or population. Its political information is similarly incomplete; provincial boundaries are only

shown in part, and *gun* boundaries not at all, though this is information that can readily be obtained elsewhere. More valuable to the historian, perhaps, is the relative accuracy with which the sites of *jōka*, *jinya* and *eki* are marked; while, for example, the post-stations on the Tōkaidō, the road leading from Kyōto to Edo, have been made famous by Japanese wood-block prints, those elsewhere in Japan are little known. Moreover, the map raises one or two interesting questions. Is there any political significance in the fact that Inō conducted what seems to be a detailed and accurate survey of Satsuma, a fief

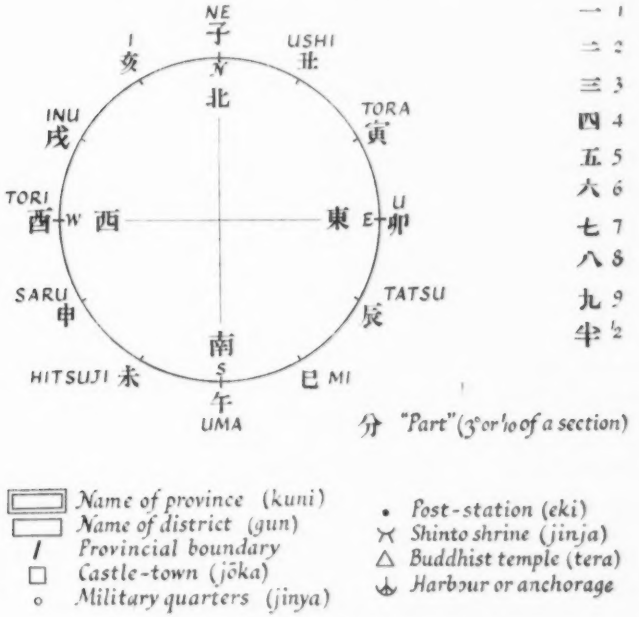


Fig. 1. The compass rose and conventional signs

in the south of Kyūshū which was both powerful and traditionally hostile to strangers, including government officials? Again the map shows more Shintō shrines than Buddhist temples. Does this arise from the Shintō revival which began in the eighteenth century, and if so does it reflect the ideas of the surveyors or of the country at large? Such questions are easier to ask than to answer, and they cannot be answered by the inspection of a single map.

The authors are indebted to Professor C. R. Boxer for his continued interest and help, to the Director of the National Maritime Museum for facilities provided for examination of the maps, and to the Officers of the Diet and Cabinet Libraries in Tōkyō for their kindness in making available the resources of the Cabinet Library.

AN EXPEDITION TO THE SIERRA DE LA MACARENA, COLOMBIA

W. R. PHILIPSON, C. C. DONCASTER AND J. M. IDROBO

THE Sierra de la Macarena, where our expedition worked from November 1949 to February 1950, is an isolated group of mountains rising from the flat plains, or llanos, which extends eastwards from the foothills of the Cordillera Oriental in central Colombia. It is separated from the Sumapaz massif of the Andes by a gap about seventeen miles wide, a neck of land slightly higher than the surrounding plain extending from its north-west corner to the foothills.

Geologically the Macarena is not related to the Andes but to hills which rise from the great expanse of otherwise virtually flat forest to the south and east. The nearest of these is clearly visible from the summit of the Macarena, but about fifty miles of low-lying forest lies between the two groups. In a flight down the Rio Caquetá several similar, but lower, hills were seen ranging from the gorge at Araracuara eastwards to a series of mountains north of Pedrera.[1] These scattered hills are believed to be the remnants of a table-land that extended through Venezuela to the Guianas.[2] The plants found on them have certain elements in common, and the collections made by Schultes have shown that the flora characteristic of this former land mass extends to the isolated hills in the south-east of Colombia. The Macarena is the most westerly of this system of hills, and it is interesting that we found that the characteristic flora is recognizable there, though masked by the presence of Andean and Amazonian types of vegetation.

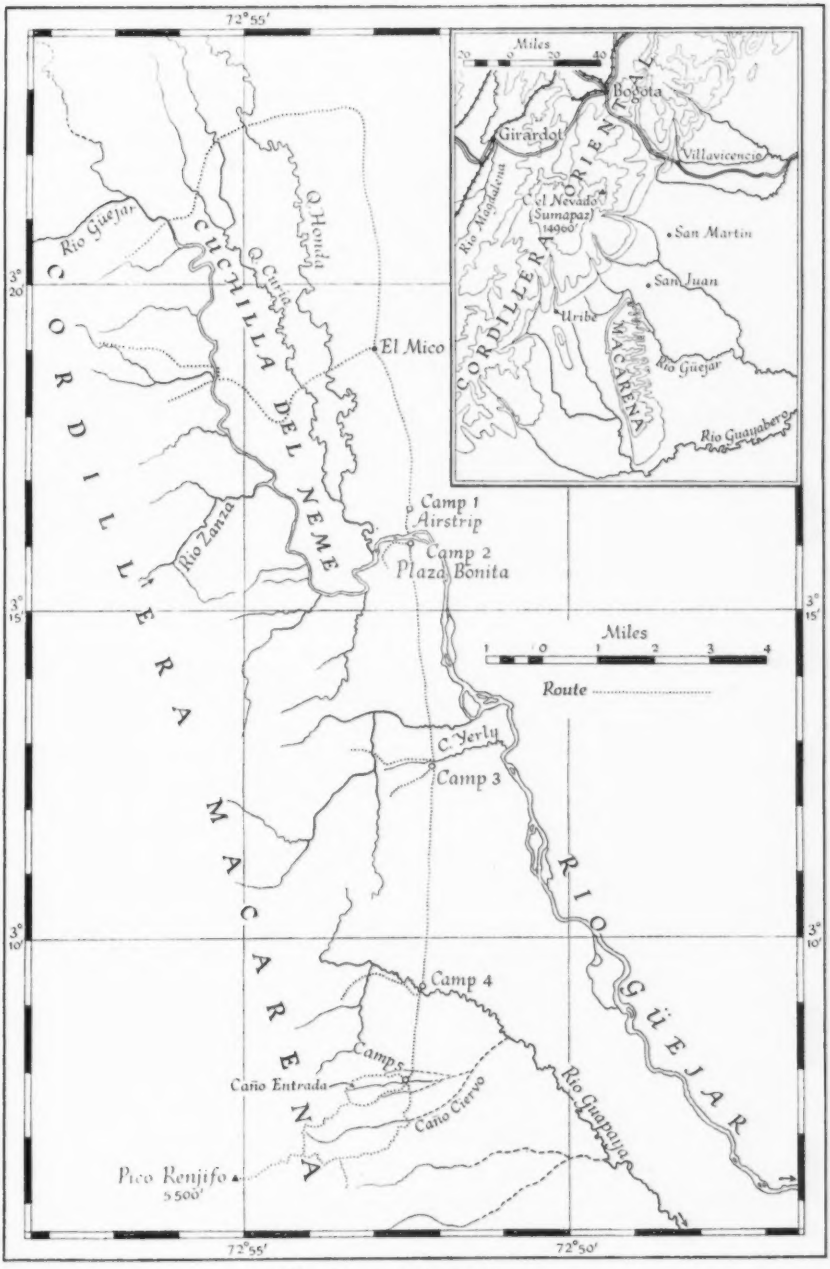
Previous exploration of the Macarena

Current maps show little more than the position and approximate extent of the range. Nevertheless, the existence of the Sierra must have been known for several centuries, for the savannas at its northern base have been used for cattle raising and the impressive north-eastern face of the range is no more than 6 kilometres from El Mico, the last *casa* before the continuous forest begins.

In spite of the presence of an established population of European extraction within sight of its northern end, the mountains themselves seem never to have supported any human inhabitants. The northern and western parts of the range are perhaps too precipitous, but it is curious that no Indians live, nor

[1] The American botanist R. E. Schultes has visited several of these hills and descriptions of them will be found in *Chronica Botanica*, 9 (1945) 123, and *Caldasia*, 3 (1944) 121.

[2] For accounts of recent expeditions to these mountains, see G. H. H. Tate, "Notes on the Mount Roraima region," *Geogr. Rev.* 20 (1930) 53; G. H. H. Tate and C. B. Hitchcock, "The Cerro Duida region of Venezuela," *Geogr. Rev.* 20 (1930) 31; D. Holdridge, "Notes on an exploratory journey in Southeastern Venezuela," *Geogr. Rev.* 21 (1931) 373; H. E. Anthony, H. A. Gleason and R. R. Platt, *Geogr. Rev.* 21 (1931) 353; B. Maguire, "Notes on the geology and geography of Tafelberg, Surinam," *Geogr. Rev.* 35 (1945) 563; C. B. Hitchcock, "The Orinoco–Ventuari region, Venezuela," *Geogr. Rev.* 37 (1947) 525.



The Sierra de la Macarena

so far as is known have ever lived, in the valleys, abounding in game, of the central massif. Indians no doubt visited the forests during their hunting and a passage in Alfred Russell Wallace's 'Travels on the Amazon and Rio Negro' may provide evidence of this. One hundred years ago when he was near the mouth of the Guaviare (the river into which the streams draining the Macarena eventually flow) the Indians, who annually ascended that river in the dry season to fish, told him "that the river is very small, and at its upper part, where some hills occur and the forest ends, it is not more than a hundred yards wide." The Indians may have meant the high ground south of San José del Guaviare, but in that case their reference to the end of the forest, and the narrowness of the river, seems less appropriate than if they were describing the gorge of the Güejar at the northern end of the Macarena.

Not only have the mountains remained uninhabited, but until recent times they have been visited only very occasionally as for example by gold prospectors, of whose visits we heard accounts at first hand but have found no published record. The first certain knowledge of the range dates from 1937 when the Shell Oil Company began to prospect in this part of Colombia. The officers of the company very kindly allowed us to see maps, photographs, and sketches in their Bogotá office which illustrate the geology of the eastern margin of the Sierra, their explorations having penetrated farthest into the mountains in the neighbourhood of the Rio Dudita; some of this geological information was published by D. Trumpy in a paper on the pre-Cretaceous rocks of Colombia.[1] The pre-Ordovician basement rocks are considered to be part of the Guayana Shield and are overlain by a considerable depth of rocks of Cambro-Ordovician age. These are followed by deposits laid down in Cretaceous and early Tertiary times. A similar account of the geology of the Macarena is given by V. Oppenheim.[2]

The mountains were penetrated more deeply in 1941, when a zoological expedition was sent to the Macarena by the American Museum of Natural History, under the leadership of E. T. Gilliard.[3] Overcoming very great difficulties of transport, this expedition made a collection of birds and mammals from land rising to 4350 feet. Owing to the extreme difficulties of the terrain their explorations were confined to an area close to their point of entry into the Sierra.

Our visit arose from a joint invitation from the Colombian Minister of Health and Dr. Santiago Renjifo, Director of the Instituto Roberto Franco, an institute set up in 1938 by the Colombian government and the Rockefeller Foundation as a centre of research on yellow fever.[4] The director realized the importance of the Macarena forests as a centre for field research not only on subjects directly concerned with tropical diseases, but also in general biology; for, unaffected at any time by man, the forests offer a great opportunity for the study of ecological problems.[5] It is proposed to set up a

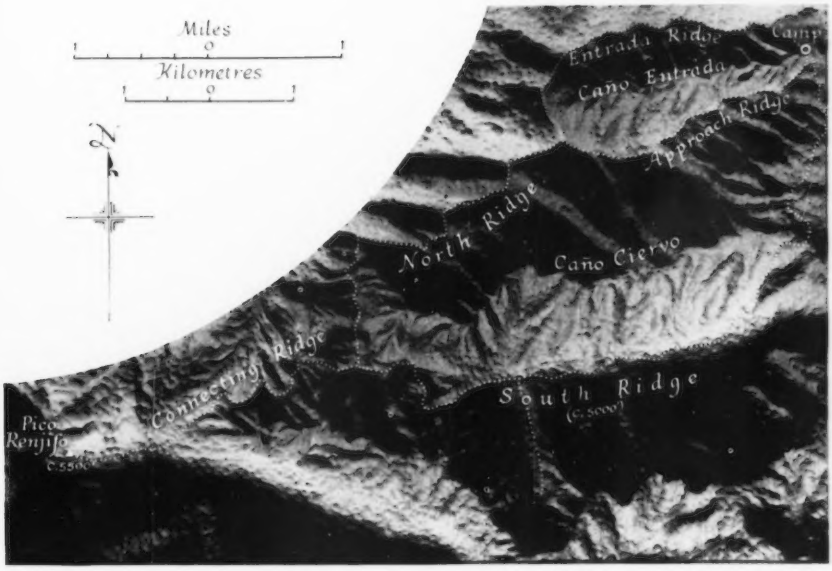
[1] *Bull. Geol. Soc. Amer.* 54 (1943) 1281.

[2] *Revista Acad. Colomb.* 4 (1940) 175.

[3] *Geogr. Rev.* 32 (1942) 463.

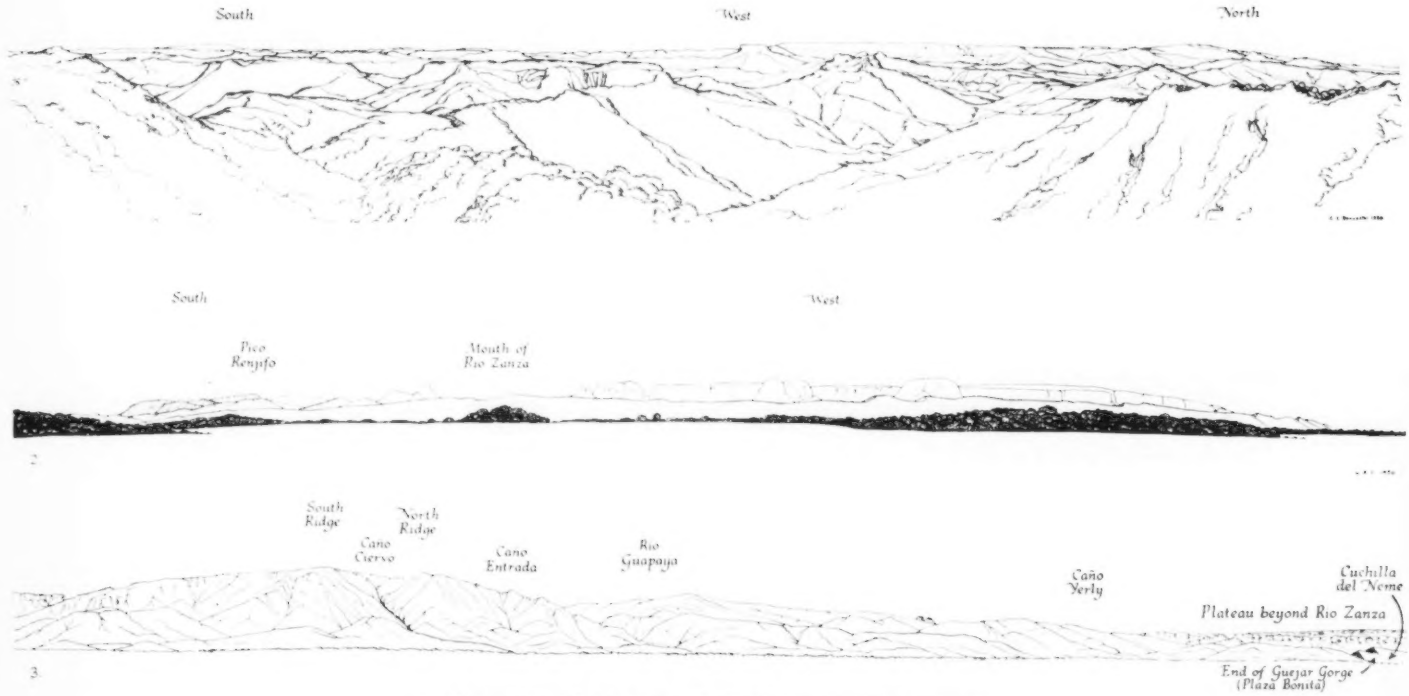
[4] An account of some of this research, carried out in the forests at the foot of the Macarena, is given in *Amer. J. Hygiene*, 39 (1943) 16.

[5] The sierra was declared a national reserve by the Colombian parliament in 1948. *Revista Fac. Nac. Agron, Medellin*, 9 (1949).



1. The central massif of the Macarena (from a plasticine model)

2. Camp in Caño Entrada



3. Panoramas of the Sierra de la Macarena (see page 199)

field research station at a suitable locality in the Macarena, which will be called the José Jeronimo Triana Biological Station, after the famous botanist. Invitations to carry out work in the area were therefore issued to biologists and geologists in a number of countries.

From the floristic and faunistic point of view the Sierra presents many interesting problems. Its geological relationship is with the similar isolated hills to the east, but plant and animal distribution is determined not only by geological history; it may be modified by climatic factors, or by the proximity of other types of vegetation. The Macarena lies in an area of transitional climate between the damper Amazonian region and the drier savannas of the Orinoco,[1] is surrounded by typical Amazonian rain forest and lies very close to the sub-tropical flora of the middle zones of the Andes. The object of our expedition was to study the interplay of these factors in the composition of the Macarena flora and fauna. This study was particularly interesting because the animals and plants have remained virtually undisturbed by man, a very rare circumstance in any part of the world. Our biological results cannot be dealt with until considerable work has been done on our collections, but as some of the country in which we were collecting was unknown, and of course unmapped, an account of our explorations may be of general interest. It should be explained however that none of us had any experience of geographical exploration or map making, and we did no more than was necessary to find our way to the best collecting grounds; but the map of our route may be of use in future expeditions until more accurate mapping has been carried out.

The Expedition in 1949–50

The expedition was in the field from 5 November 1949 until the middle of February 1950. The permanent members were W. R. Philipson, J. M. Idrobo (botanists) and C. C. Doncaster (zoologist). A. Fernandez (botanist) was with us until December 15, and R. Jaramillo (botanist) joined the expedition from 1 to 28 January 1950. L. Richter (entomologist) also joined us on January 1 and remained until the expedition ended. In addition to the scientific members there was an average of five Colombian personnel; a cook, two men in charge of mule transport and general camp duties, and two or three men for assistance in field collecting. In the first weeks all available men were put on to cutting the trail, so that we had their assistance in collecting only for a few days in the Guapayá area and after our permanent camp was reached. We should like to mention particularly the assistance given to the botanists by Isidoro Cabrera, and to the zoologists by Carlos Balcazar. Their knowledge of forest life was invaluable, they quickly learnt the methods of collecting, and without them the quality of our collections would have suffered; the number of trees collected would have been reduced and fewer birds would have been obtained from the higher altitudes.

We flew south from Villavicencio on November 5, landing at an air-strip south of El Mico on one of the last savannas before the continuous forest begins. A palm-thatched shelter had been erected close to the air strip and here we set up our first camp. From the savanna we could see a long panorama

[1] A. Dugand, *Chronica Botanica*, 7 (1942) 71.

of the northern part of the Macarena, and, far to the south, a much higher block of hills. We could not be sure that this was the highest ground in the Macarena but our plan was to move southwards towards this high block, down an old trail cut by the Shell Oil Company at the eastern fringe of the mountains. As we moved south we could collect in the forest of the llanos and of the foothills to either side of the trail, and from time to time we hoped to enter the hills to locate the high range which we believed to be near the Rio Guapayá. We were unable to start south immediately because the Rio Güejar had not fallen sufficiently to allow loaded mules to pass, so we collected in the forests and on the savannas north of the Güejar until a dug-out canoe had been made; but even then further heavy rain had made the current too strong for navigation. By November 12 it was possible to begin moving stores across, and most of the party slept that night on the south bank, known as Plaza Bonita. As we had only two mules at that time, all our equipment could not be moved to the river in one day but on November 13 everything was got down to the river and across by canoe.

We collected in the neighbourhood of the Plaza Bonita camp while the old trail was being opened up, and climbed a small hill rising scarcely 1000 feet above the river; some interesting plants were collected from its precipitous western face. Delays due to bad weather and the number of large trees which had fallen over the trail postponed the move to our next camp. Our original intention had been to clear the trail as far as the Rio Guapayá and transport our equipment there in one move, but as clearing the trail proved to be slower than we expected, we decided to shorten the daily walk to and from the trail head by moving our camp to Caño Yerly. This we did on November 21. From this point the trail was opened more quickly, and we moved to a camp site on the Rio Guapayá on November 26. For these moves and for the remainder of the expedition, we had seven pack animals and all our equipment could be transported at once. Throughout the expedition the mules were based on the savanna at El Mico, the rancho of Sr. Benjamin Cifuentes whose very generous help and hospitality were of great value to the expedition. Stores were flown to the air-strip twice a month and brought through the forest by the mules. At Caño Yerly we collected in the forest of the llanos and foothills; trips farther into the Macarena were made on either side of the Caño, but the hills were of only moderate altitude and at no point did we get a view of the higher ground to the south.

The mule-trail from the air-strip to the Rio Guapayá was fairly level, with only local but often steep descents into the channels of the small streams. It has been cleared to a breadth of 6 or 8 feet by the Shell Oil Company, but the subsequent growth of trees and undergrowth had made it difficult to follow in some places and only near the Rio Guapayá were considerable stretches found that needed no more than rapid clearing with the machete. Elsewhere obstructions caused by fallen trees had to be cleared by the axe, or a path opened round them, often laboriously through tangled woody creepers. Logs were removed only if they projected more than about 2 feet above the ground because the mules could step over obstacles of that height with ease. Roots and trailing stems were cleared only on steep slopes where they would have tripped the mules as they slithered down. Throughout most of its course

the trail skirts the foothills of the Macarena and continually crosses streams coming down from the mountains. In the neighbourhood of Caño Yerly these streams are crossed before they debouch on to the llanos and the trail rises and falls sharply. Caño Yerly itself is the only stream of any size between the Rio Güejar and the Rio Guapayá and about 15 yards wide; though only knee deep at the height of the dry season it is probably a serious obstacle for the remainder of the year. The Rio Güejar, 100 to 150 yards wide, can be crossed by loaded mules during the dry season but we found it a very real obstacle because of its depth and the strength of the current, even as late as the middle of November. The Rio Guapayá is only 20 to 40 yards wide; it rose quickly after rain but we did not see it during the wet season. South of the Rio Guapayá we did not follow the old trail, which here keeps some distance from the foothills, but cut a new one a little west of south as far as Caño Entrada. In the dry season Caño Entrada is a stream a few yards wide running among large boulders.

The site where our trail reached the Rio Guapayá proved disappointing, for the camp was in dense forest on flat land some distance from the foothills of the Sierra. We attempted to reach the hills through the forest to the south of the river, but progress was very slow and even from the tops of the trees no landmarks could be seen. In our later attempts to reach the Sierra from this camp we waded up the river until it entered a rocky gorge, and climbing the hills to the south of the gorge obtained extensive views of an intricate system of valleys between steep hills; our view-point was at about 2300 feet and none of the hills visible to us rose higher than about 3000 feet. We had expected much higher mountains to lie at the head of the Rio Guapayá and it was still possible that they lay beyond the foothills now visible. But even to get a view of them would have meant a difficult journey preceded by several days' preliminary trail-cutting. In order to avoid moving the camp up-river before it was known whether the highest land lay in that direction, a reconnaissance flight was arranged. After delay due to bad flying conditions and the considerable political unrest on the llanos, we flew over the northern part of the Macarena on a day when the highest land was under cloud. We were able to locate our Guapayá camp by means of a smoke fire, and could see clearly that the hills drained by the Guapayá were of only moderate altitude, the high block that we had seen from the air-strip lying farther south. The pilot of the plane, Captain Series, made a timed run from our camp to the nearest rim of the high mountain, a distance of approximately $3\frac{1}{2}$ miles on a bearing of 20° west of south. Unfortunately the clouds made it impossible to ascertain whether this block was the highest in the whole Sierra, nor could we study the topography of the peak from the air. The ascent to the rim of the high land appeared feasible by ridges on either side of a steep valley drained by a river whose course was visible as a slight fold in the forest, running north of east to meet the Rio Guapayá some miles below our camp. It was evident that our camp must be moved farther south, and in spite of the continuous wet weather we immediately cut a reconnaissance trail a little west of south to the most considerable stream. While the men enlarged this trail for mules, we ascended the bed of the stream as far as the first fall in a very picturesque gorge. Climbing a narrow undulating ridge until we were stopped by a wide

belt of densely matted undergrowth at 2600 feet, we could see much higher land ahead and felt reasonably confident that the ridge we were on led up to it without any considerable drop in altitude. A camp site was therefore selected, pleasantly situated by a perennial stream, at the very base of the steep ridges leading up to what proved to be the central massif of the Macarena. For this reason we gave the name Caño Entrada[1] to the stream; we are not certain whether it was the valley of this stream or that of a larger river a few kilometres farther south (which we called Caño Ciervo) that we had seen from the air. During our reconnaissance flight we had seen only one considerable river crossing the forested lowlands to meet the Rio Guapayá and it therefore seems probable that all the streams north of Caño Ciervo unite with it and follow an east-north-easterly course. We have not been able to place with any certainty the stream called Caño Guapayito on the maps issued by the Shell Oil Company; it is shown much nearer to the Rio Guapayá than our Caño Entrada, and must therefore be one of the small cañitos crossed by our trail immediately south of our Guapayá camp. Similarly, the Caño Veinte of the Shell Oil Company's maps appears too far south to be our Caño Ciervo. We have considered it best to name afresh the two rivers we encountered.

Our camp on the north bank just below the first waterfall, the last level site before the climb to the 5000 feet high Sierra begins, consisted of two tents for the scientific personnel and a palm-thatched ranchito for the men's hammocks and stores. In addition we built a shelter in which to cook, a shelter for the botanists stores, and one in which to dry zoological specimens. The palm whose leaves were used for thatching belongs to the genus *Attalea*; a grove of these trees with smooth massive trunks fortunately growing near the site. The trees were felled, and the thick felted hairs among the leaf-bases burnt off. The immense fronds we split down the centre of the mid-rib and the two halves, turned tip to base, were placed on the roof together, tied in place with the leaflets of the unexpanded fronds of the same palm. The top of the roof was made waterproof by placing the large flat leaves of *Marantaceae* across the ridge-poles.

A small enclosure was fenced off for the mules. Owing to the lack of green fodder the animals were not kept in the forest for more than one night at a time, unless they were needed to move camp, when they stayed for two nights. The leaves the mules ate most freely were of small palms and species of *Marantaceae*. When the fortnightly stores were expected, a man, or two men if the Güejar was expected to have risen, walked back to El Mico to bring one or two mules. These returned to the air-strip with boxes of specimens ready to be sent back by plane and the whole mule team then brought out the fortnightly supplies, finally returning to El Mico to graze on the savanna with the animals belonging to Sr. Benjamin Cifuentes until the next supplies were due. Our principal rations were rice, beans, potatoes and plantains, with cooking fat, coffee and blocks of drinking chocolate. The mules ate maize and panela (unrefined sugar) night and morning when in the forest. We ate chocolate and the panela too when away from camp and during the later stages

[1] The new names in this paper and on the accompanying map are those proposed by the authors.

of the expedition we arranged for a supply of tinned foods for use when we slept on the mountains.

Game was plentiful and we went short of meat only when continuous rain or the pressure of work hindered hunting. As a general rule sufficient game was obtained during collecting trips, and on Sundays the men were free to go to the Rio Guapayá where they always obtained many fish with bow and arrows. The birds we most frequently used as food were the "paujile," or curassow (*Crax alector*) and the "parva" and "parva real," or Spix's and white-headed piping guan (respectively *Penelope j. jacquiaçu* and *Pipile c. cumanensis*). We also ate another species of "paujile," Salvin's razor-billed curassow (*Mitu salvini*), the black-wattled guan (*Aburria aburri*), two tinamous (*Tinamus tao* and *T. major ruficeps*), as well as a dove, a quail, and a macaw. Mammalian meat was provided by the herds of "cafuche," or white-lipped peccary (*Dicotyles labiatus*) and less frequently by the "sahino," or collared peccary (*Dicotyles tajacu*), and a deer, probably one of the brockets.

The ascent of the Sierra

Once the Entrada camp was established we climbed Approach Ridge, south of the Entrada waterfalls, passed a dense thicket growing up over an old landslide and reached the crest of the ridge at about 4000 feet. Judging by the experience of the American expedition farther south, we had expected to come upon an irregular plateau, but found ourselves on a narrow ridge looking across a wide and very deep valley to another and higher ridge farther to the south. This southern ridge appeared to rise towards a peak at the head of the valley and we saw that, unless the ridge on which we stood also led westward to the head of the valley without any substantial drop in altitude, our means of entry into the Sierra would not enable us to reach the peak. The next day we set out to traverse the northern ridge as far west as possible. We reached the crest of the Approach Ridge in an hour, and from there the North Ridge rose quite steeply until we found ourselves on a ridge more or less parallel to the South Ridge and only slightly lower; by 2 p.m. we had reached an elevated part of the ridge from which we could see the highest peak still a long way to the west. Weeks later we discovered that we must then have been practically at the junction of the North and South Ridges, but at the time we mistook the deep valley between us and the peak for a continuation of the valley of Caño Ciervo. It is in fact a stream running west towards the heart of the Macarena.

As it was clear that we could not hope to make protracted, or repeated, collecting trips to the highest peak we decided to collect as thoroughly as possible on the most accessible high land, along the North Ridge which rises in places above 4500 feet. The South Ridge rises slightly higher (5000 ft.), but so little that we did not expect the vegetation or bird-life to be substantially different, and its ascent from our Entrada camp appeared a very difficult undertaking. When the weather became more settled we hoped to make one or two collecting trips to the peak in order to discover what type of forest flourished there, and also to see whether any higher land lay beyond. For some time, daily collecting trips were made, the two botanists ascending the North Ridge on alternate days.

Our intention was to make a three-day trip to the peak. On the first day we would traverse the North Ridge, descend into the intervening valley and camp there; the next day we would ascend the opposite slope, cutting a trail to the summit and returning to the same temporary camp on the second night. The return to Entrada camp would be made on the third day. On Christmas Day we suspended collecting and pushed farther westward along the North Ridge to prospect the way for the attempt. Even though we came on streams draining westwards we still regarded them as tributaries of Caño Ciervo. This was the first water we had discovered in the mountains but as they were practically dry we could not count on it even for a temporary camp. When we had made our preparations the weather broke again and we decided to prepare an alternative route by opening the way to the South Ridge. This ridge we thought would lead straight westwards to the peak so that once its ascent had been made the summit might be reached in a day; and with water for two days we need not descend from the ridge. On the first day a trail was opened to Caño Ciervo; parts of it had been opened before for hunting. As the south bank of the river was hemmed in by densely forested cliffs we ascended the very rugged bed of the river until flatter forest was reached. From the lower slopes of a hill we could see a very steep but continuous slope ahead, apparently rising to the South Ridge, and in the early afternoon we ascended this for about 1000 feet. This route could only become practicable with heavy packs if we could eliminate the strenuous wading, sometimes waist deep over the slippery boulders. The next day we improved the route to Caño Ciervo, crossing it at a point lower down where the ascent of the south bank was feasible and from here Isidore cut a track which linked with the end of our trail of the previous afternoon in a surprisingly short time. As we returned to camp we improved the trail by choosing the most gradual gradients. When this was next used, the foot of the climb to the South Ridge was reached in forty minutes. A trail was then cut up to the crest of the ridge and for some distance westward along it.

On January 15 we set out with R. Jaramillo, but unfortunately the South Ridge proved ill-defined, consisting of a series of minor peaks connected by saddlebacks. When descending from these eminences there is seldom anything to show which of the descending tongues will lead on to the next rise in the ridge. Several hours were lost when we traversed a branch ridge to the south, and when we regained the main ridge it was time to sling our hammocks. The next morning, leaving our packs behind, we cut a trail as quickly as possible and succeeded in reaching the base of the final ascent to the peak before we had to return. As it turned out our next attempt was not made along the South Ridge because we had discovered that the northern and southern ridges join. On January 21 we set out taking three men to carry our packs for the first three hours, and reached the end of our trail in the early afternoon. In three more hours we had cut a path up the final long but gradual ascent. The peak falls away very abruptly to the west, and from here we obtained a magnificent view of the whole Sierra and were able to confirm that this peak was the highest in the range. We slung our hammocks between the small palm trees that dominate the vegetation near the summit. Up here, the nights are very cold with a high wind from the north east. Usually it is

possible to obtain some shelter, but warm bedding is necessary. As mosquitoes are not troublesome we did not carry mosquito-nets after the first attempt, and later, as ants were virtually absent, we did not carry hammocks, but slept on beds of palm leaves and grasses. Nor did we carry waterproof awnings, so we slept on the mountains only during periods of settled weather and met with only light showers, though mist and heavy dew sometimes made everything wet.

The foot trail from Entrada camp to the summit of Pico Renjifo struck straight from the river to the low ridge running a few yards from the southern bank of the caño. From this point it follows the ridge continually, at any junction of ridges always taking the branch which was found to lead to higher land. The first leg of the trail, from the camp to the top of the Approach Ridge, rose by series of rather steep undulations. But, except for three or four very dense tangles of climbers which had to be by-passed and the tangle of undergrowth which stopped us on our first reconnaissance, the forest was not very dense. Some of the ascents, particularly the last ten minutes, are steep, and the last climb is irksome because in places the ground is covered with a deep yielding mass of leaf-mould. Approach Ridge joins the North Ridge by a narrow saddle-back beyond which the trail rises over some exposed rocks, and the upward trend is interrupted only once before the junction with Entrada Ridge. Except during the last few days of the expedition, Entrada Ridge was not used; it is doubtful which of the two routes is easier. Progress was not difficult along these high ridges because of the presence of an animal trail which was particularly well defined whenever the ridge narrowed. The North Ridge is extremely narrow and frequently falls away precipitously to the valleys on either side; the precipices are particularly steep at the head of the Entrada valley and at the western end of North Ridge. Without the covering of forest it seems certain that erosion of these steep slopes would be much more rapid.

At the head of the valley of Caño Ciervo the water-shed is ill-defined and meanders around several inter-digitating water courses, some of which contained streams even towards the end of the dry season. Our trail did not follow the water-shed here, but dipped into the shallow valleys, for we found it easier to use the path we had opened already than to cut through the dense forest that flourishes in these very deep gullies. In any event it was necessary for the trail to descend to the best of these streams so that we could drink and collect water on our way to and from the peak; nearer the camp refreshing drinks could be obtained by cutting the stems of certain woody climbers (particularly a species of *Doliocarpus*) whose watery sap ran freely from the cut end. These did not grow above 2500 feet and so were left behind after the first half hour. After this very intricate part, the trail reaches the massive peak itself and strikes straight up the gradual slope to the flat summit.

Two further visits were made to the peak; Philipson and Isidoro Cabrera slept there on the night of January 25–26, making a further collection of plants, and Doncaster and Carlos Balcazar on the night of January 29–30, making a panoramic sketch of the Macarena and collecting birds. It was decided to name the mountain Pico Renjifo, after the Director of the Instituto

Roberto Franco who had done so much for the expedition and who had resigned his post to organize a public health undertaking. The altitude of the peak was determined by three methods. By measuring the angle of elevation of the peak from Plaza Bonita air-strip and by measuring the distance[1] on a timed run of the plane at a constant speed the result was 5550 feet; by a direct reading on the altimeter of the plane it was 5400 feet; and a comparison of barometer readings at the peak and at our Entrada camp gave two results, 5490 feet and 5560 feet.

The high block of land on which we spent most of our time lies between the Rio Guapayá and the Rio Dudita. Not only is the massif higher than the rest of the Sierra but it has a different aspect, being cut by deep, but not cañyon-like, valleys until only narrow twisting ridges remain. These unite towards the west into a massive flat-topped peak with an abrupt drop to the west. The ridges bounding the valleys of the Entrada and Ciervo are of approximately uniform altitude until they descend steeply, but not precipitously, to the eastern llanos.

The Sierra de la Macarena rises from tropical rain-forest with a heavy rainfall only seriously moderated in January and February. Its base lies at about 1500 feet and nowhere is it high enough to approach the limit of trees. The predominant vegetation is therefore forest in which a number of zones, due in part to altitude and in part to the incidence of cloud and wind, can be recognized. Many of the cliffs are too precipitous for vegetation, and the brows of several of them and of the minor peaks and ridges are so well drained and so exposed that a scrub vegetation is found, or even open grassland or fern-brake. Most of the northern half of the Macarena consists of a deeply eroded plateau and the central part has been worn into wide valleys with inclined sides, where only a few isolated abrupt hills reach the original level of the plateau. In contrast, the western and northern margins of the Sierra are composed of flat-topped hills separated by cañyon-like valleys. To the west, the plateau appears to have remained as a practically continuous block, while to the north the rather lower table-topped hills are more dissected. It is flanked by small hills isolated from the main plateau, some of which retain their original height whereas others are lower and conical. These hills are undergoing active erosion, some of the exposed sandstone faces crumbling at a touch. Towards the east erosion is more mature and none of the flat plateau remains. We saw the southern half of the Macarena only at a distance, but part of it has been described by E. T. Gilliard. The hills to the extreme south seem to be low and to have smooth contours.

One of us (Philipson) stayed at El Mico from January 28 to February 7. From here it is possible to reach the Rio Güejar on horseback, and in the dry season the river can be crossed by wading. The north-eastern cliffs of the Macarena are therefore easily accessible and were climbed in three places; on two occasions small botanical collections were made on the flat plateau due west of El Mico. On the second of these visits a path was cut for several kilometres westwards without encountering any change in the smooth but gradually rising plateau.

[1] Dr. Julian de Zulueta, Director of Research, and later acting Director at the Roberto Franco Institute kindly obtained these readings for us.

Note on the three panoramic views of the Sierra de la Macarena facing p. 191.

1. View from the highest summit, Pico Renjifo. To the extreme south, beyond the southern Macarena, the group of hills including Mt. Chiribiquete can be seen at a distance of approximately one hundred miles. The dissected plateau forming the western rim of the Macarena is estimated as being between 4500 and 5000 feet. Due north, the Cuchilla del Neme can be seen behind the conical peak at the mouth of the Rio Zanza.

2. View from the savannas near El Mico. The forest which borders the Quebrada Honda and the Quebrada Curia forms a dark line in the middle distance; beyond this runs the ridge known as the Cuchilla del Neme. This ridge is separated from the Macarena by the Rio Güejar. To the right of the Rio Zanza steep sandstone cliffs rise to a plateau; to the left of the Rio Zanza the hills are lower and smoother. The central high massif of the Macarena is stippled.

3. View from the savannas of Talanquera, looking west (after a drawing by the Shell Oil Company). To the right and left of the panorama portions of the dissected sandstone plateau can be seen. The central massif lies to the right of the Rio Guapaya, Pico Renjifo being concealed by South Ridge.

THE MOVEMENT OF POPULATION IN ENGLAND AND WALES IN 1851 AND 1861

C. T. SMITH

IN THE first half of the nineteenth century patterns of population distribution in England and Wales were changing continuously against a background of rapidly increasing total population and an ever-expanding industrial system. The drift to the towns, and particularly to London, was evident even in 1801, while the textiles and iron of the north and the Midlands had robbed the south and east of England of their former supremacy in population even before the use of steam power was fully established in many branches of industry. The next fifty years assured Britain's future as an industrial nation. Trade grew by leaps and bounds and coal, iron and steam replaced wood and water as the fundamental resources of industry. People flocked to the towns and ports, and above all, to London and the manufacturing towns on the coalfields.

By the middle of the century agricultural areas began to suffer a net loss of population to other parts of England and Wales in spite of the high rate of natural increase in the country as a whole. In 1851, Wiltshire, Montgomery and Radnor showed a decline of population, but by 1861 this list also included Norfolk, Suffolk and Cambridgeshire. In the 'forties and 'fifties the existence of a rural surplus was evident in many parts of the country. Low wages and unemployment were causing the labourer and even the small farmer to turn from agriculture to the higher wages of the towns, or to the opportunities for more prosperous and independent farming in the newly opened lands of North America, Australia and New Zealand. Emigration was "in the air" no less than migration. Emigration schemes and cheap passages on the one hand, and the facilities afforded by the new railway system on the other, made easier both emigration and the movement of labour within the country. A number of interesting problems arise from this movement of population: from what parts of England and Wales was the exodus most significant, and how did the sources of the migrants compare geographically with those of the emigrants. And if these distributions present a logical pattern, how do they compare with the distribution of industry and the prosperity of agriculture.

One looks to the census returns for information on migration and emigration, but difficulties arise in its interpretation. For migration, there are detailed statistics on the "Birthplaces of the People" in the 1851 and later censuses, but there is no similar statistical analysis of emigration. The "Notes to the Census" provide some basis for comparison, for the Census Commissioners were asked to report the reasons for any abnormal variation in the population of a parish and their reports were embodied in the Notes. They usually attribute a decrease to emigration or migration or to a combination of the two, or they specify some other reason.

There are however several limitations to the use of the Notes. First and perhaps most important, they refer only to those parishes where a marked

decrease of population had occurred; one is dealing therefore with the places from which the movement was most obvious. Secondly, reference is often made, no doubt rightly, to the stoppage of mills and factories, the depression in agriculture, or the pulling down of houses as causes of decline; whether the people thus rendered surplus migrated or emigrated is not recorded. The language is sometimes vague: "A number of families have left the parish," or "The decrease is due to the removal of labourers." Such phrases have here been taken to mean migration. On the other hand some of the Notes are remarkably explicit; from Long Crendon in Buckinghamshire there came this comment in 1861: "The decrease of population is attributed partly to emigration and partly to the migration of families to Redditch in Worcester to obtain employment in the manufacture of needles." But it is only occasionally that one is provided with useful data on the direction of movement as well as its causes.

Figure 1 shows the distribution of those parishes from which emigration and migration took place according to the Census Notes for 1851 and 1861. If it can be shown by comparison with the statistical data available that the general pattern revealed by the Census Notes is fairly accurate as a measure of migration in these years, then it can be the more safely assumed that the distribution of the emigrants which the Census Notes record is a true indication of the areas from which emigration was most important. The most obvious point which emerges from the maps is the extent to which migration increased in the decade, and this impression is confirmed in the statistics, though one suspects that the more frequent references in 1861 are partly due to a greater awareness and a more thorough analysis of population movements at that census.

For 1851 the map shows a very scattered distribution both of migration and emigration, but in the south-west interest attaches to emigration. This was less marked in 1861 but, even in the earlier year, migration seems to have been the rule from the old textile areas of the Cotswold scarp. In Wales, emigration and migration were equally important in 1851, as a relief to agricultural distress on marginal lands, but the region received less attention in the Census Notes of 1861. One can see evidence of migration and emigration from East Anglia in both years, but the movement outwards seems to have been much stronger in 1861. This hint of increased movement is borne out by the statistics. For example, between 1851 and 1861, the number of Norfolk-born people recorded in London and Lancashire increased from 31,866 to 49,436 and from 1625 to 2474 respectively. It is difficult to believe that migration was relatively unimportant in Kent and Sussex, since the attraction of London must always have been powerful, and one can see that emigration from this area had fallen off in 1861. What is however striking in both maps is the depopulation of many parishes in Lancashire and the West Riding of Yorkshire. By 1861 it was much less obvious in the West Riding, though the movement from the moorland parishes to the industrial districts continued. It was in this area, chiefly in the Poor Law Union of Clitheroe, that the Census Notes bear witness to the depression in handloom weaving, due to the increased use of machinery, and the consequent movement to the towns—Blackburn, Bolton and Preston are specifically mentioned. This

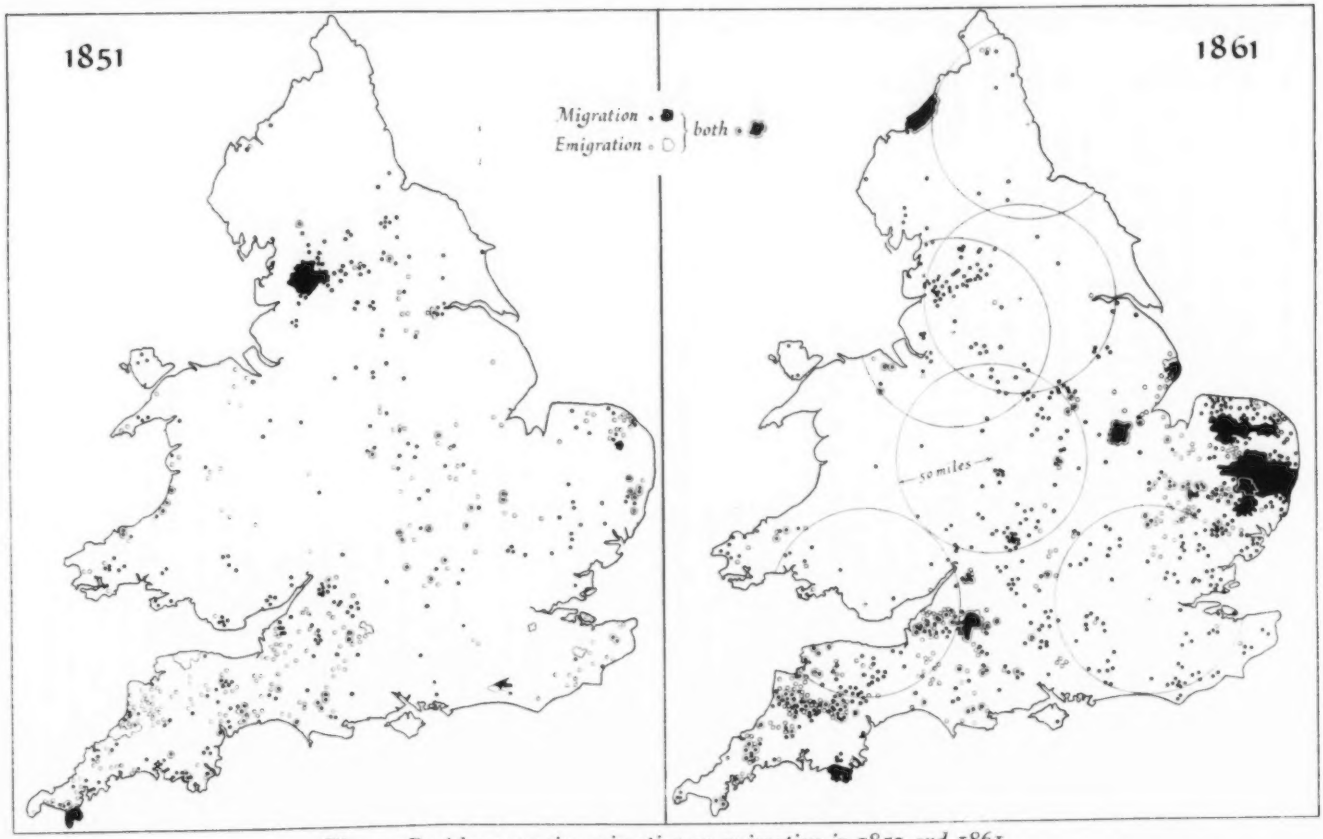


Fig. 1. Parishes reporting migration or emigration in 1851 and 1861

movement was still in progress in 1861, though the distress of the handloom weaver in the face of machine competition had been obvious since the 'thirties.

The two maps give an impression of increased internal migration in 1861 from areas where it was already important in 1851; but this is less true of the sources of the emigrants. Emigration ceased to be of importance in Wales, Yorkshire, the Midlands, Kent and Sussex, and became much more concentrated in East Anglia, the Fenlands and the south-west. One suspects that the extension of railways and the rate of industrial expansion had created opportunities for migration rather than for emigration in all areas but those farthest removed from the industrial areas and from London. East Anglia and the south-west, hard hit as they were by the contemporary changes in agriculture and more isolated from the industrial zones than other counties, tended to send more of their surplus labour overseas. In 1861 there was no mention at all of emigration from Lancashire, Cheshire, Staffordshire, Derbyshire or Warwick, and only two references to it in Yorkshire.

The distributions of the places mentioned in the Census Notes do not provide a quantitative picture of the movements of population. Figure 2, based on the census statistics for 1861,[1] shows the volume of migration from each county, and provides a check on the accuracy of the Census Notes as a measure of the relative importance of the movement in different parts of the country. Movement within a county does not appear and the volume of migration reported varies to some extent with the size of the county; for example, a migration of thirty miles may not appear if it was within a large county, but it may well be reported between counties of a smaller size. For this reason the movement from the handloom weaving and agriculturally marginal parishes of Lancashire and Yorkshire, prominent in Figure 1, passes unrecorded in Figure 2.

Surprisingly few counties show a net increase of population by migration, and these are of course the chief industrial counties (Lancashire, Cheshire, Staffordshire, Warwickshire, Northumberland and Durham) together with the London area and Hampshire. In Yorkshire the attraction of the West Riding is counterbalanced by the movement outwards to Lancashire, Durham and Northumberland; in Wales as a whole, the distinction between the growing industries of South Wales and the dispersal from the remainder does not appear. There is a fairly close agreement between the two maps in the volume of migration from the south of England and the Midlands, and particularly from the south-west and East Anglia. At first sight Gloucestershire appears an anomaly, but it was here that the movement to Bristol, whether from the rest of the county or from Somerset or Wiltshire, helped to balance the numbers going outwards to the Midlands, South Wales and London. The chief discrepancy between the two maps is the absence in the Census Notes of any stress on the movement away from the Home Counties,

[1] From the total population of each county has been subtracted the total of persons recorded as born in that county, whether resident there or not. The difference is a measure of the *net* loss of population and is expressed as a function of the area; Rutland and Leicestershire have been combined. Counties showing a net influx of population are left blank on the map.

Buckinghamshire and Oxfordshire, a matter which is dealt with below. Nevertheless, it would seem that the Census Notes present a fairly accurate sample of the areas from which migration was most important in 1861 and the information they provide helps to fill out the bare statistical pattern. One is thus led to accept their testimony concerning the origins of emigrants in 1861.

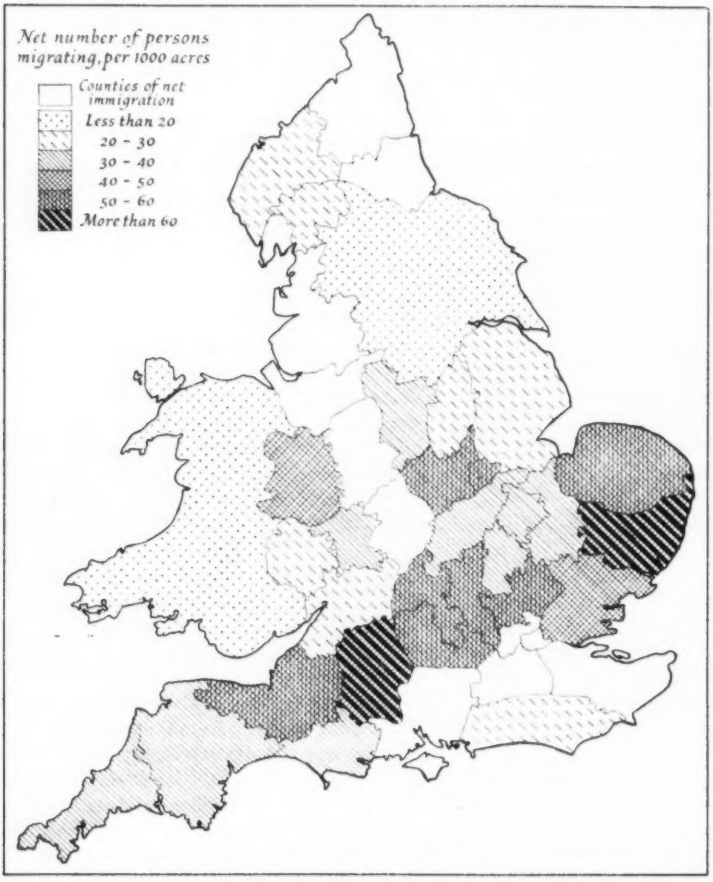


Fig. 2. Migration, 1861 census

The volume of migration was highest in south-east England, where it seems to have been a reaction to severe economic difficulties as well as to the attraction of London. The Census Notes leave no doubt that it was unemployment and low wages, caused partly by the replacement of manual labour by machinery, that were driving men off the land, together with the decline

in some areas of long-established textile industries. Yet it was in this short period, between the abolition of the Corn Laws and the flood of cheap wheat imports from the United States and Russia in the 'seventies, that English agriculture enjoyed a period of prosperity. Nevertheless, it was a prosperity which affected the north and the Midlands, with their pastoral farming and proximity to urban markets, rather than the corn-growing south and east. Grain prices remained low and prosperity failed to reach the agricultural labourer or the small farmer, for wheat farming required new capital investment in land improvement, drainage and agricultural machinery in order to maintain profits.[1] In southern England the wages of agricultural labour failed to rise with prices in the 'fifties and unemployment was far more common than in the north and the Midlands; here pastoral farming permitted higher wages and the nearness of the industrial areas necessitated them. In fact agricultural wages in the 'fifties, according to Caird's estimates in his tour round England and Wales in 1850–51,[2] or according to Purdy in 1861,[3] shows a remarkably close parallel with the volume of migration from each county.

For 1861 it is possible to support the testimony of the Census Notes with a statistical analysis of the currents of movement, for the census reports from 1851 onwards include tables showing for each county the numbers born in that county and in other counties of England and Wales, Scotland and Ireland. There was, as one would expect, an immensely complex mingling of people born in neighbouring counties. Figure 3 is an attempt to show from these statistics the way in which the industrial areas gained population at the expense of the agricultural regions. That part of the movement between two counties which balances has been ignored, since it represents a redistribution of people between them, and had no effect on the increase or decrease of total population in the area as a whole. In Figure 3 the difference between the number of persons born in one county and living in another and the number born in the latter county and living in the former has been used as a measure of the *net* movement which increased or diminished the total population of that county. For example the net migration of 2801 people from Norfolk to Cambridgeshire means that there were 2801 more persons born in Norfolk and living in Cambridgeshire than there were born in Cambridgeshire and living in Norfolk. It is thus not a picture of the total amount of movement, but an analysis of the currents of net movement which supplements the rather scanty information in the Census Notes. Unfortunately it is impossible to draw a similar map for 1851, because the figures for movements between counties in that year are on the basis of the "Registration Counties," the boundaries of which show a good deal of overlap with the civil counties.[4]

The striking feature in Figure 3 is the drift to London. Every county in England and Wales except Surrey and Rutland sent over a thousand people

[1] W. Hasbach, 'History of the English agricultural labourer,' pp. 242 *et seq.*

[2] J. Caird, 'English farming in 1850–51' (1852), p. 512

[3] F. Purdy, "On the earnings of agricultural labourers in England and Wales," *J. Roy. Statist. Soc.* 24 (1861) 328–373.

[4] Prof. H. C. Darby, "The movement of population to and from Cambridgeshire between 1851 and 1861," *Geogr. J.* 101 (1943) 118–25.

more into the London area than it drew from it, and south of a line from Lincolnshire to the Severn the movement to London was of major significance for every county. To the north of this line there was some competition from other industrial areas. One can see the rival attractions of Birmingham and

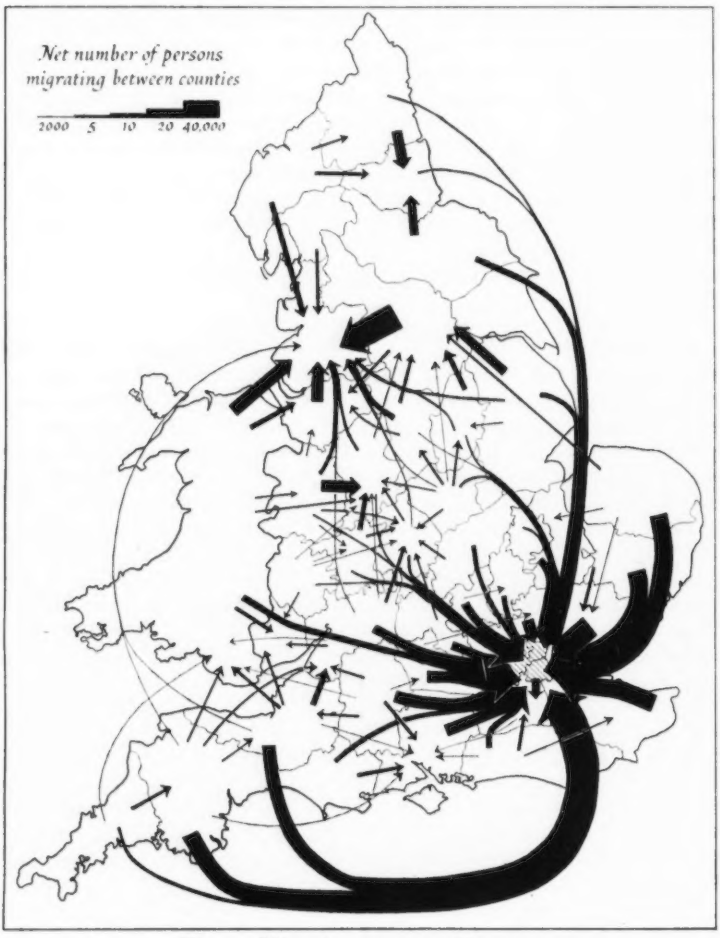


Fig. 3. Migration currents, 1861 census

the Black Country in the figures for Northamptonshire, Oxford and Gloucestershire; the attraction of South Wales and Bristol in Gloucestershire, Devon and Somerset; and the attraction of Southampton in Dorset, Wiltshire and Sussex. Nevertheless, London was the most powerful magnet and there is little net movement in other directions as one approaches the capital. Indeed,

what is surprising is the absence of any appreciable net migration between counties in the south-east of England. It is true that there could be little attraction for an agricultural labourer in moving from one rural area of low wages and unemployment to another but, in the light of the "wave" theory of migration [1] which envisages a movement in the early nineteenth century by short stages towards an area of attraction, one would expect to find some evidence of such a migration between neighbouring counties. These statistics cover however not merely the previous decade, but the whole generation, since they are based on place of birth. There was certainly a small resultant drift from Norfolk to Cambridgeshire and Suffolk, but it was insignificant compared with the numbers of the Norfolk-born recorded in London. Curiously enough, the extent of the drift to London is almost unmentioned in the Census Notes. Scattered references to it occur in Middlesex, Cambridgeshire, Essex, Norfolk and Gloucester, but it did not receive the emphasis it deserved, and one suspects that the Census Commissioners were too well aware of its existence to consider it worth mentioning.

In the south-west the opportunities for migration were few. One reads in the Census Notes of a drift into the chief towns of Devon, Cornwall and Somerset from the surrounding countryside. Torquay and Plymouth are mentioned and, indeed, the attraction of the growing seaside resorts was strong, not only here but at Brighton, Bournemouth and Southend. Yet the capacity of the seaside resorts, the market towns and even the ports, such as Bristol or Southampton, to absorb population was limited (though the effect of Bristol was seen in the movement into Gloucestershire from Somerset, Devon and Wiltshire). Migration to South Wales was always possible and the Census Notes mention such a movement of labourers from Devon and Somerset to the mining districts. From Steeple Ashton and Great Hinton in Wiltshire there was in 1851 "Emigration and migration of families to Wales for employment in the ironworks." In 1861, three parishes in Somerset reported migration to the mining districts of Wales (Chewton-Mendip) or of coal-miners to South Wales (Chew Magna and Clutton). More often the Notes merely speak of a movement to mining or manufacturing districts, or even just to "large towns." It would seem however that much of the labour for the South Wales coal mining and iron and steel industries was derived from other parts of Wales. In 1851 in particular there are frequent notes to this effect; within Glamorgan and Monmouth, migration to the "iron and coal districts" or to Swansea is reported from fourteen parishes, and parishes in Carmarthen, Pembroke, Cardigan and Brecon report a similar movement.

The position of the south-western counties was difficult enough, since they were on the whole far from the major centres of industry and from London, to which they sent most of their surplus labour. But what made matters worse was the eclipse of the long established textile industry through the competition of the West Riding. The Census Notes bear witness to the decline of this industry and to the competition of machines at Bradford-on-Avon in Wiltshire, at Culmstock in Somerset and in several Cotswold

[1] A. Redford, 'Labour migration in England, 1800–1850' (1926), pp. 160–61. E. G. Ravenstein, "The laws of migration," *J. Roy. Statist. Soc.* 48 (1885) 167–235.

parishes in Gloucestershire. In Devon the causes of decrease in many parishes is well summed up in the Notes for the Tiverton and Launceston Districts, where it is glumly stated that "The decrease of population is attributed to the junction of farms, to the introduction of machinery into agriculture, to the facilities for migration offered by the railway and to the stoppage of mining operations." In the tin and copper mining parishes, as in other mining areas of the country, one gains the impression of a local drift of population from worked out zones to more prosperous areas. In general, migration to London was the main outlet for the surplus population of the south-west but, in view of the distances involved, it is not surprising that it was supplemented by that emphasis on emigration that we have already noted.

Of all the regions from which migration occurred, East Anglia stands out as being most affected by contemporary difficulties. Rural depopulation is reflected in the decline in the population of whole counties; Cambridgeshire fell by 5 per cent. between 1851 and 1861, Suffolk by 4 per cent. and Norfolk by 2 per cent. It was in East Anglia, the traditional granary of England, that the unemployment of the labourer and the failure of the small farmer to keep pace with the need for capital improvement reached their highest proportions, while in the Norwich area and along the Suffolk–Essex border decaying textile industries provided their complement of distressed weavers and wool-workers. These were the factors that lay behind emigration and the immense drift to London in 1851. Ten years later one can trace a growing interest in long-range migration to the industrial regions of the north, though it always remained very subordinate to the movement to London. The Census Notes bear out the hints contained in the statistics. In 1851, both emigration and the removal of labourers to other parts are frequently mentioned, but what detail there is of the direction of movement speaks of a local drift to nearby towns. Bury St. Edmunds and Ipswich are reported as gaining population from surrounding parishes, and weavers move into Norwich from the neighbouring districts. The drift to London remains unmentioned, but the statistics testify to its importance in 1851 as well as in 1861. In only two instances in 1851 are there indications of a further movement, one of which refers to the attraction of the "manufacturing districts," and the other to the "migration of labour to the railway works now in progress near Hull." In 1861 the situation is very different; whole districts are reported as having lost population to the "manufacturing districts," to large towns and to the north of England. For Chatteris, in Cambridgeshire, Manchester is specifically mentioned as the destination; for four parishes in Suffolk, Durham provided the attraction; and the Mitford District of Norfolk sent some of its surplus to Yorkshire and Northumberland.

The movement into the cotton manufacturing towns of Lancashire and the textile industries of the West Riding was only less important than the drift to London, and one can see in Figure 3 how the attraction of these areas made itself felt as far as Devon, Somerset and East Anglia. What is significant is the degree to which Lancashire dominated migration in the western half of England. Liverpool, in particular, drew the seafaring men of Cornwall, Devon and Wales, and it was the chief port of entry for the immense influx of Irish into Lancashire. The influence of the West Riding on the other hand

was restricted more to the east coast; Norfolk, Lincolnshire and Nottingham were important sources of labour. Nevertheless the main sources of labour for the West Riding, Lancashire and the north-east were always the surrounding counties. Cheshire, north Staffordshire and north Shropshire sent most of their surplus to Manchester and the cotton districts, while North Wales had its closest connection with Liverpool. Farther east, Derbyshire and Nottingham were zones of competition for labour between Lancashire and the West Riding, just as Cumberland was between Lancashire and the north-east. The more local currents of migration to the West Riding are obscured by the size of Yorkshire, but it seems reasonable to suppose that the movement into Durham was from the North Riding, while that into the cotton districts of Lancashire was partly a reflection of the distress of the handloom weavers on the borders of the two counties, and partly a result of the greater attraction of the cotton industry at this period. What is striking in the statistics is the size of the migration. The drift from Yorkshire to Lancashire of 57,865 people is merely the resultant of a complex movement between the two counties. The total number of Yorkshire-born in Lancashire in 1861 was 91,835.

The Midlands present a confused picture in Figure 3, partly because the industrial zone was spread over parts of Staffordshire and Warwickshire with Birmingham, the Black Country and the Potteries as the chief centres of attraction, but one can trace a zone of counties from which the Midlands drew most of their labour. From the Census Notes and their distribution one sees a strip of country on the margin of the Pennines where an always difficult agriculture was now turning people away from the land. Apart from the depopulation of agriculturally marginal parishes, there was an exodus of rural textile workers and lead-miners. One reads in the Census Notes of the removal of factory workers and glovers from a rural parish in Derbyshire to Nottingham, where they had obtained employment; and of the decline of lace manufacture at Castle Donington, leading to migration and emigration. Leicestershire too was a county of expulsion, in spite of the movement into Leicester itself, whether of rural unemployed, or of distressed framework knitters from Rothley nearby and from other parishes in the neighbourhood of Leicester. From the district of Market Harborough it was reported that fewer hands were being employed in agriculture than formerly and that the unemployed had gone to the manufacturing towns, while at Market Harborough the stoppage of a carpet factory had caused many families to go to Yorkshire in search of employment. A similar tale comes from Nottinghamshire, where there was a general drift out of the county in spite of the local movement into the city of Nottingham.

The map of migration currents presents a picture of the net movements between counties in 1861, but it only hints occasionally at the local drift into nearby towns; the movements into Gloucestershire and Hampshire can only be interpreted in the light of the growth of Bristol, Southampton and Portsmouth. The local attraction of a regional capital, a growing port, or a seaside resort is frequently mentioned in the Census Notes. Plymouth, Torquay, Brighton, Leicester and Nottingham, for example, were reported as having gained population at the expense of surrounding parishes.

The outline of a pattern emerges from all the thousands of individual moves which, by 1861, had taken people from their birthplaces to neighbouring parishes, to different parts of the country, and to the smoky, overcrowded but prosperous industrial towns. The basic movement was to the nearest market towns, which often failed to relieve the pressure of a surplus agricultural population; especially in the more rural parts of England, in the corn-growing districts and in those areas where declining industries had already created an urban problem of over-population. Those who moved farther afield tended to go to the nearest major industrial region, and from the statistics it would seem that in the middle of the century a good deal of this movement was direct rather than a drift by stages. The building of the railways must have made it easier and cheaper to move over longer distances than in an earlier period. Yet one must bear in mind that behind the net movements illustrated in Figure 3, there was an immensely complex drift between counties even though there was no resultant movement in any particular direction.

If one may be permitted to generalize, it would seem that each industrial region possessed a "sphere of attraction," the radius of which was governed by the size and rate of expansion of the industry and its demand for labour, by the degree of agricultural distress in the neighbouring rural areas, and by the accessibility of the industrial area. With the exception of London and the contribution made by the Irish to the growth of population in Lancashire, each industrial region recruited by far the greater part of its labour in a zone of which the radius was rarely more than fifty miles and usually less. London alone drew in large quantities upon areas that were up to and even over a hundred miles distant. These zones are indicated by circles in Figure 1.

There were few parts of England which lay more than fifty miles from an industrial area, or from a growing port, or from London; and it was in those few isolated areas that emigration was most significant in 1861—East Anglia, the Fenland, south Lincolnshire, Devon and Cornwall.

RECENTLY DISCOVERED TRACES OF THE FRANKLIN EXPEDITION

R. J. CYRIAX

IN AUGUST 1949 Inspector H. A. Larsen, of the Royal Canadian Mounted Police,[1] with several companions reached King William Island by aeroplane. He examined on foot the coast between Cape Felix and Cape Franklin, and also spent some days on the mainland, where he searched Starvation Cove and its surroundings. He discovered many relics of the expedition commanded by Sir John Franklin, who in 1845 sailed from Great Britain in H.M. Ships *Erebus* and *Terror* to seek a North West Passage.[2] This article is based on Larsen's official report on the finding of the relics. In assessing their historical significance frequent reference is necessary to the proceedings of the Franklin expedition itself and to some of the search expeditions.

The *Erebus* and *Terror* were beset in the ice of Victoria Strait in September 1846, and in May 1847 lay about 18 miles north-west of Cape Felix. When they were abandoned in April 1848 by Captain Crozier, on whom the command had devolved after Franklin's death in June 1847, they had drifted into a position that lay about 15 miles north-north-west of Cape Jane Franklin. Crozier, with all his surviving officers and men, landed on King William Island, and left a record in a cairn on the shore about 1½ miles to the north of Cape Jane Franklin. Around this cairn, built on what he believed to be the "Point Victory"[3] of James Clark Ross (1830), his party left many articles of equipment before continuing their march towards the Great Fish River. Most of the traces found since then on the coast between the cairn and Cape Felix can reasonably be presumed to have been left there by small parties before the ships had been abandoned, whereas the vast majority of the relics discovered on the coast to the southward of the cairn, and around the cairn itself, must have been left there during the attempt to reach the Great Fish River after the ships had been abandoned.

Lieutenant W. R. Hobson, second in command of the private expedition in the *Fox* led by Sir Leopold McClintock, found Crozier's record in 1859. He was the first explorer after the disaster to visit the part of King William Island recently examined by Inspector Larsen, and was followed very soon afterwards by McClintock himself, who searched most of it. Eskimos had not visited it since the disaster but snow covered the ground at the time of his search. In 1879 Lieutenant Schwatka examined the whole of the coast in question. Since most of the snow had melted, he found many traces that had been concealed from McClintock and Hobson; but Eskimos had been there since these

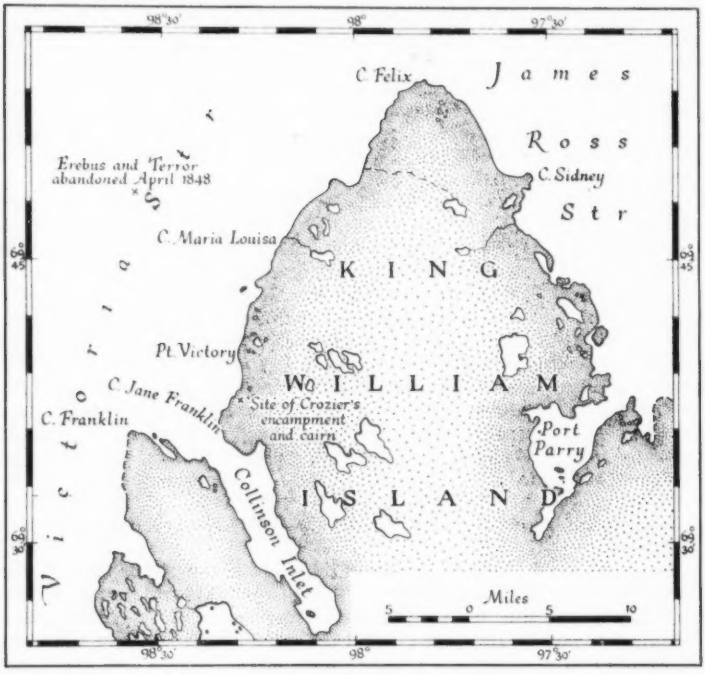
[1] Inspector Larsen has the experience of many seasons' patrol work in the Canadian arctic. Between 1940 and 1942 he made the first traverse from west to east of the North West Passage (*Geogr. J.* 110 (1947) 1–16), for which achievement he was awarded one of the Society's Gold Medals in 1946.

[2] See R. J. Cyriax and J. M. Wordie, "Centenary of the sailing of Sir John Franklin with the *Erebus* and *Terror*," *Geogr. J.* 106 (1945) 169–97.

[3] Differing opinions have been expressed as to the position of Ross's "Point Victory." Crozier believed that he had himself camped and left his record there; but Larsen, agreeing with Schwatka and Burwash, thinks that Point Victory is the headland about 3 miles farther north. It is so marked on the sketch-map accompanying this paper.

officers and he discovered only few traces that had remained wholly undisturbed. Major Burwash in 1930 searched Cape Jane Franklin and a short stretch of coast lying to the northward of it, but the remainder of the coastline examined last year by Inspector Larsen had not been searched since 1879.

Larsen's description of this coast is much more detailed and precise than any of the published accounts with which the writer is acquainted. He found the coast to be broken into bays, large and small, with rounded ill-defined capes. The actual shore was composed of ridges of broken limestone with occasional granite boulders. The sea-ice, which was very heavy, had pushed up ridges far



on to the land. The interior of the island was pleasant and dotted with very many lakes.

At Cape Felix, Larsen found the remains of a human skull embedded in moss between some rocks on a ridge about half a mile from the sea. These remains were examined at Ottawa and found to be parts of the skull of a single individual, slightly built, of white race and aged about twenty-five years. He was undoubtedly one of the officers or men of the *Erebus* or *Terror*, for the only other white men who visited Cape Felix before Larsen were the parties led by James Clark Ross, by Hobson, and by Schwatka, and none of these parties suffered any casualties there. Larsen's discovery is of great interest, for none of the previous searchers has found the bones of members of the Franklin expedition anywhere on King William Island to the north of Crozier's cairn. For this reason it has hitherto been generally believed that Franklin himself and the officers and men,

who presumably died on board the ships while these were near King William Island, were buried at sea. This discovery shows however, and Larsen believes, that some may have been buried on land although, as he states, the finding of bones or graves would be only accidental, for the terrain is difficult to examine and any crosses or memorials would long ago have been removed by Eskimos, signs of whose old encampments he saw everywhere. The man whose skull was found may not however have died on board ship, for at least one party, and probably several, visited King William Island before the ships were abandoned. Hobson found numerous traces of a shooting or magnetic station near Cape Felix, apparently occupied for some time by a party from the Franklin expedition, and Schwatka found not only these but many other traces in the neighbourhood.[1] Larsen thinks that he could discern, about 2 miles to the north of Cape Felix, two small low islets not previously charted, but the state of the ice prevented his visiting them. Near Cape Maria Louisa, Larsen found some pieces of oak, apparently from sledges or boats, and many hardwood chips. These also presumably came from the lost expedition, many relics of which were found by Schwatka in an Eskimo cache near that cape.[2] A party from the *Erebus* and *Terror* may possibly have stayed there for a time.

At the place where Crozier left the record, about 1½ miles to the north of Cape Jane Franklin, Larsen discovered numerous scattered relics and remains of equipment: among other items a large button, some blue cloth, canvas, rope, a piece of cheese-cloth to which a leaden stamp was attached, two pieces of a wooden keg, boat nails, parts of boots, and two iron brackets for strengthening a sledge or boat. The brackets may possibly be part of the "heavy iron work of a large boat" noticed by McClintock.[3]

In the vicinity stood a cairn which Larsen took down. Beneath it lay fragments of blue cloth with some shreds of red, and two bone buttons. He dug beneath to the depth of about 1 foot, found no other relics, and rebuilt the cairn exactly over its former site. The origin of this cairn seems to be as follows. Schwatka found the record which McClintock had deposited in Crozier's cairn, but the cairn itself had been reduced to a heap of stones and he does not appear to have rebuilt it. He did erect another cairn in the vicinity where he found an open grave, in and around which lay some human bones believed to be those of Lieutenant Irving of the *Terror*, for a silver medal bearing that name lay on one of the stones composing the grave, from which it had apparently been removed by Eskimos. In the grave lay a large quantity of blue cloth and some gilt buttons, apparently part of an officer's uniform, and since Schwatka's second in command stated that a "few pieces" of the cloth were removed, most of it must have been left. Schwatka brought away the bones, afterwards buried at Edinburgh, and built the cairn, writing an indication of its purpose on the top stone. In 1930 Burwash found a cairn near Crozier's encampment, built over some cloth which had become a pulp but could still be identified as blue uniform cloth; he dug up the gravel beneath but found no other relics and re-erected the cairn on its original site. He apparently saw no signs of an inscription, which may have become obliterated, and seems to have thought that this cairn, the only one he found in the vicinity, had been built by the Franklin expedition. But if it had been, Schwatka would have found it, for he searched the neighbourhood after the snow had entirely melted and noticed

[1] Sir F. Leopold McClintock, 'The voyage of the *Fox* . . .' 5th edition, London, 1881, pp. 300, 301, 317, 318; W. H. Gilder, 'Schwatka's search,' London, 1881, pp. 134, 135, 147; H. W. Klutschak, 'Als Eskimo unter den Eskimos,' Vienna, 1881, p. 96.

[2] W. H. Gilder, *op. cit.*, pp. 147, 148.

[3] Sir F. Leopold McClintock, *op. cit.*, p. 317.

only the remains of the one originally erected by Crozier.[1] So far as can be ascertained from the available data, the cairn found by Larsen thus seems to be the one rebuilt by Burwash from the remains of the cairn erected by Schwatka over Irving's grave.

Farther south, between this cairn and Cape Jane Franklin, Larsen collected many relics which, there is every reason to believe, were left there during the march towards the Great Fish River. They included fragments of blue cloth, chips of hardwood, canvas, rope and a cork sole. At Cape Franklin he found the tops of two tins.

Lastly, Inspector Larsen searched the coast around Starvation Cove, situated on the mainland at the south end of the bay lying to the westward of Point Richardson, and he also visited some of the islands nearby. This has generally been considered the farthest point reached during the attempt to reach the Great Fish River. Eskimos told Captain Hall in 1869, and also Schwatka, that they had found a boat and the bodies of white men at the cove, and numerous traces have since been discovered there and in the neighbourhood. Larsen found a leather boot sole and the remains of old camps on a low point of land jutting out from the south end of Point Richardson; while most of the camps seemed to be of Eskimo origin, he thought that some came from the Franklin expedition.

His report concludes as follows: "The country we walked and flew over is a difficult country to search, owing to being so much cut up into bays, islands and inlets, also owing to its many rocky ridges; therefore if any graves, records or relics remain, either on King or on the mainland, they will be found perhaps by accident. One thing is certain, the route travelled by the Franklin party cannot have been very thoroughly searched or examined, except perhaps by Eskimos."

[1] W. H. Gilder, *op. cit.*, pp. 124, 125, 126, 151, 287, 288; H. W. Klutschak, *op. cit.* pp. 92, 93; L. T. Burwash, 'Canada's Western Arctic,' Dept. of the Interior, Ottawa, 1931, p. 92, map on p. 96, Plates 4 and 5 on p. 85.

A NEW APPROACH TO WORLD DISTRIBUTION MAPS

F. V. BOTLEY

THE MAJORITY of distribution maps in modern atlases are drawn upon "recentred" or discontinuous projections, often of the equal area type. Although such maps are satisfactory for most land distributions, they leave something to be desired in their representation of the shapes of Asia and the polar regions and of the relationships between one continent and another. These shortcomings are largely due to the fact that the continents are centred upon arbitrarily selected meridians which are not the true axes of the land masses, and the possibility suggests itself of improving upon these maps by constructing an oblique recentred projection.

The Oblique-Gores

The true axes of the main land masses of the world have already been suggested by various authors. For the Americas Winkel adopts an axis running north-north-west to south-south-east [1]; for Africa and Eurasia Thornthwaite selects a south-west to north-east axis,[2] while Dilloway states that the axis of the Pacific Ocean runs north-west to south-east.[3] By a fortunate coincidence all these axes more or less cross the same great circle at right angles, and meet at the same two antipodal points. This suggests a sound basis for an oblique recentred projection plotted on four gores or lunes which taper towards antipodes at 60° N., 150° E. and 60° S., 30° W. These gores cover the Americas, Eurasia and Africa, Australasia and Antarctica, and the Pacific; their central points are at 23° N., 72° W.; 14½° N., 33½° E.; 28½° S., 129° E. and 13½° S., 144° W. respectively. The great circle running across the middles of the gores through these points (corresponding to the Equator on the usual recentred projections) has its vertex at 30° N., 30° W. Only in one case has it been found convenient to use a meridian (30° W.) as a boundary between two gores. For many land distributions the Pacific gore can be omitted altogether, so that the scale of the three remaining land sections may be increased.

Oblique-Gore cylindrical equal area projection

Figure 1 is plotted on Lambert's cylindrical equal area projection, the error-less projection-equators coinciding with the four main axes of the gores. Distortion increases rapidly at right angles to these axes and reaches its maximum at 30° W., 30° N. and 15° S., 86° E. on the Eurasia–Africa gore, at a distance of 60° from the projection-equator. At these two points the scale is doubled in the direction parallel to the axis of the gore, and halved at right angles to it.

The map has a number of advantages over existing ones in that it is a good general distribution map which shows Antarctica as a whole continent, and represents the circumpolar areas and the grouping of continents round them clearly and adequately. On the usual recentred projections Antarctica is divided

[1] O. Winkel, "Flachentreue schiefachsiger Zylinderprojektion," *Petermanns Mitt.* 55 (1909) 380.

[2] C. W. Thornthwaite, 'The cylindrical equal area projection for a new map of Eurasia and Africa.' Univ. of California (1927).

[3] *Geogr. J.* 100 (1942) 65.

into several widely separated sections, so that its size, shape and position relative to other continents are not shown well. The arcuate form of the northern coast of Asia, which is also distorted on the Recentred Maps, is shown well on the oblique-gore arrangement.

As on all cylindrical projections, great circles at right angles to the four projection-equators are straight lines. Two of the most important groups of airways, the east to west lines across North America and the Europe–Middle East–Far East–Australia lines, lie more or less in this position, and may be plotted as straight lines. The projection would thus be very suitable for a map of air routes and political divisions.

It has a further general advantage in its flexibility. Since they are not all of the same width the gores do not have a rolling fit along their common boundaries, but they can be tilted so as to touch one another at any common point in order

Figure 1

to emphasize a particular aspect of global geography. They could for instance be arranged as a Star Map centred near the North Pole. The separate gores may also be used as regional maps of the continents and any gore may be extended beyond its boundaries so that every continent may be shown in its entirety without interruption. The system may be applied to any other cylindrical projection; the Mercator and the Gall stereographic (the latter with standard parallels at a distance of 25° from the projection-equators) might prove particularly suitable.

Oblique-Gore azimuthal equal-area projection

In Figure 2 the four gores have been drawn on the Lambert azimuthal equal-area projection centred on their middle points. This is a considerable improvement upon the cylindrical map, particularly with regard to shapes and directions, and it shares most of its other advantages. A better arrangement has been achieved by tilting the Australasia gore to meet the Eurasia gore at the Malay Peninsula, and by tilting the American gore to lessen the gap between South America and Africa.

Method of construction

For the general purpose of drawing any oblique case of any projection, a large Transverse *plate carrée* nomograph was calculated trigonometrically and drawn on graph paper so that the Equatorial case (formed by the graph lines) and the Transverse case were superimposed one upon the other. Great circles, and the distances along them, may be identified by sliding a ruler marked in degrees of longitude across this chart, the effect being the same as that of sliding a nomograph across a map. By this means the axes and boundaries of the gores were

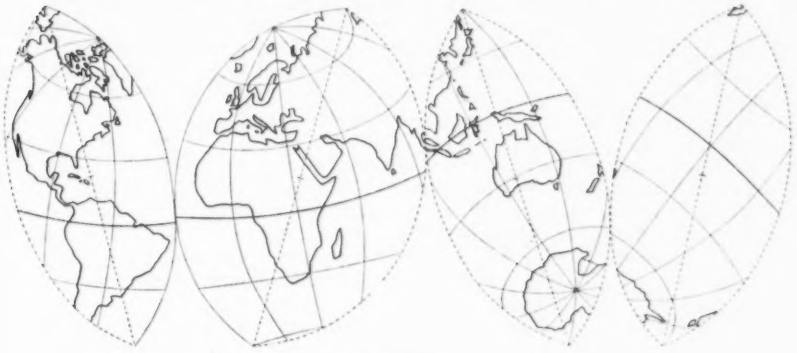


Figure 2

identified. Reduced nomographs on the appropriate scale and projection were then drawn on tracing paper and the graticules of Figures 1 and 2 were plotted graphically in the usual way.[1]

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IRRIGATION IN THE INLAND NIGER DELTA OF THE FRENCH SUDAN

R. J. HARRISON CHURCH

THE UPPERMOST reach of the Niger which ends at Bamako in the French Sudan is an old stream which once flowed into an inland lake: eventually this lake overspilled to connect with the lower Niger. In the former lacustrine and inland delta area, from Ségou to Timbuktu, the present river has an almost insignificant gradient and is easily diverted into a new course to the south when an older one becomes obstructed by Harmattan wind-borne sand. The annual floods of the Niger and Bani spread water over flat country up to 80 miles north and north-east of Mopti.

Bélime surveyed the area in 1919–21, and the completion, in 1923, of the railway from Koulikoro to Dakar made it possible to import constructional equipment for irrigation works. Small experimental schemes were initiated at Niénébalé in 1925 and at Baguineda in 1929, and levées were built along the Niger downstream from Ségou for 73 miles. The Sansanding barrage was begun in 1934 and completed in 1941 except that temporary wooden sluices, replaced by steel ones in 1947, had then to be installed.

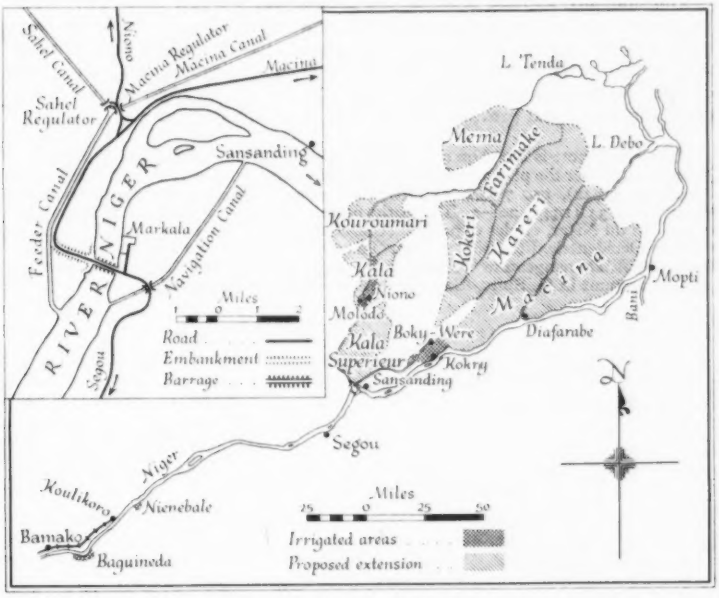
The barrage is 884 yards long and the bridge above it is one of the three in the whole length of the Niger. It is extended northwards by an embankment, to prevent lateral percolation, so that the total length of the structure is a mile and three quarters. The barrage has nearly 500 small sluice gates adjusted in height like a deck chair, by travelling lifting-arms, according to the river flow. An amazing fish-pass allows the free passage of fish. This barrage has raised the level of the Niger by some fourteen feet and the Sahel and Macina canals convey water from the present river to its former *thalwegs*.

It is hoped ultimately to irrigate 2,250,000 acres (see map) to support a million African peasant colonists. So far 50,000 acres have been irrigated in the inland delta region, to support 16,000 colonists who come from the French Sudan and the Upper Volta. On arrival the colonists are provided with hut, garden, seed, animals, food and simple equipment. The land is prepared mechanically but each family has its own holding, for an attempt is being made to solve a general African problem—the need to combine modern and improved methods of farming with the traditional system of peasant holdings. After paying their dues the peasants are free to sell their produce through the cooperatives or otherwise.

Originally planned mainly for the production of export cotton, the emphasis is now on rice which is much needed locally; and inexperienced farmers tend to grow a poor quality cotton which is costly to export from so far inland. Rice now occupies about 55 per cent. of the acreage controlled by the *Office du Niger*, and cotton 20 per cent. Some 13,000 tons of surplus rice were sold in 1949 and nearly 9000 tons were consumed by colonists. Much early criticism of the irrigation works arose from the initial emphasis on cotton and because the scheme was often linked with the Trans-Saharan railway project. There is an enormous literature in French, serious and frivolous, about both but little in English. A recent tour I made throughout French West Africa has prompted this note, for I was very much impressed by the enthusiasm of the colonists and the efficiency of the *Office du Niger* in bringing life to these famine lands.

The Niger has not deposited fertile silt to anything like the same depth as the Nile and engineers are not worried by silt accumulation, but this advantage is outweighed by inferior fertility. Fields are left uncultivated during the warmest part of the year, yet sulphate of ammonia is often needed for rice and nitrate of ammonia for cotton, as well as phosphates and lime. In texture the soils are compact and badly aerated, compared with Nile clay lands, and need deeper ploughing and more organic material. Acidity makes them better suited to rice than to cotton.

The Sahel Canal feeds the areas of Molodo and Niono. Originally intended mainly for Egyptian cotton in the north and for American cotton in the centre,



The inland delta of the Niger

these regions are now being turned over more and more to rice. Some 21,000 acres are cultivated and there are 19 villages, averaging 280 inhabitants and mostly settled since 1940; the average net income per adult male worker is £60 per annum. Each farmer works three fields, 5 acres for cotton, 5 acres for fallow millet for ploughing-in and 2½ acres for rice. Completely mechanized rice production has also been started experimentally at Molodo.

The areas of Boky-Wéré and Kokry, fed by the Macina Canal, have always been mainly concerned with rice production. The holdings, which are sown each year, are of 8 acres in one field, and 29,000 acres are cultivated. There are 30 villages, averaging 340 inhabitants and mostly established between 1937 and 1944. The average net income per adult male worker is £40 per year. These areas are more fertile and have been worked continuously and for a longer period. They are ideal for rice because of the greater impermeability of the soil.

These rapidly developing irrigation works raise several problems. Water

removed from the Niger may so impair its vigour, that the annual floods will no longer remove the obstructing sand deposited in the shrunken dry season river by the north-eastern Harmattan wind. Critics of the *Office du Niger* maintain also that many lakes which used to fill annually are not filled now. This may be merely a cyclical change, but if the *Office du Niger* is the culprit it has revived far more land that it has impoverished. If another barrage were constructed downstream, the lakes could be filled permanently and perennial pastures created. Nigeria is also interested in the water retained by the French irrigation scheme and asked, at the Anglo-French Communications Conference in 1947, that figures be secured and a joint river survey undertaken.

The annually flooded areas of the Niger, downstream from the present irrigations, are ancient grazing grounds; during the floods the herds move north-westwards to fly-free areas, which provide pastures only in the short wet season. The cattle routes lie across the advancing irrigation canals and newly cropped lands. Quarrels have occurred, and the *Office du Niger* should reserve cattle routeways and provide canal bridges and transit pastures.[1]

[1] The above note is based on a paper read to the Institute of British Geographers in January 1951. For the physiographical aspects of the region, see Y. Urvoy, 'Les bassins du Niger' (1942), pp. 79–85, and R. H. Forbes, "The Transsaharan conquest," *Geogr. Rev.* 33 (1943) 208–9. The early field investigations are in E. Bélime, 'Les irrigations du Niger, études et projets' (Dakar, 1921), and 'La production du coton en Afrique Occidentale Française' (1925). The earlier days of the undertaking are discussed by A. Demangeon in 'Problèmes de géographie humaine' (1942), and there is a popular account in G. Spitz, 'Sansanding: les irrigations du Niger' (1949).

WATERMARKS AND THE STUDY OF EARLY MAPS

WATERMARKS: mainly of the 17th and 18th centuries. By EDWARD HEAWOOD. (Monumenta chartae papyraceae historiam illustrantia, or collection of works and documents illustrating the history of paper. General editor: E. J. Labarre. Vol. I.) *Hilversum: Paper Publications Society*, 1950. 12×9 *inches; 154 pages and 533 pages of plates.* £10 10*s*

THIS is at once an indispensable reference book and the record of a remarkable achievement in sustained research. The history of Edward Heawood's work on watermarks is agreeably told by Mr. Crone in the short memoir prefixed to the volume and in Heawood's own introduction. Briquet's great collection "Les Filigranes," published in 1907, reproduced over 16,000 watermarks, but was limited to those before 1600 and thus left English papers out of account. With characteristic pertinacity and method Heawood applied himself to the formation of a *corpus* of specimens from the seventeenth to the nineteenth centuries. In 1924, when he published in the *Geographical Journal* his first paper on watermarks, the mass of later material was practically uncharted. Half a dozen subsequent essays by Heawood, printed in the *Transactions of the Bibliographical Society*, have—with that of 1924—established themselves as the most serviceable general guide to the papers used by English printers after 1600. The last of these essays appeared in December 1949; and he continued to make tracings until long past his eightieth year. Those familiar with the difficulty of copying watermarks even in the best conditions, which are all too seldom available, will appreciate the tenacity of purpose called for by this task.

Mr. Labarre has done a generous service to Heawood's memory, and to all who use the evidence of watermarks, by reproducing over 4000 of his tracings and copies in their original size. The preliminary pages of this handsomely produced volume contain a short preface by Mr. Labarre, Mr. Crone's memoir, a substantial introduction by Heawood, and a valuable series of indexes. Heawood's introduction describes the origin and arrangement of his collection, analyses the regional distribution of devices, and discusses their dating, interpretation and derivation. The main index is a key to the sources from which the copies were taken. Its arrangement follows the order of the reproductions, which are grouped under the emblems figured in the marks. Mr. Labarre rightly acknowledges the " patient and expert labour" by which Mr. Crone completed this index, left unfinished by Heawood. The list of sources plainly shows how large a proportion of Heawood's material was geographical and, indeed, to be found in the Society's collections. Here, as in Briquet, the alphabetical arrangement of the emblems points to the need for a polyglot glossary of their names.

As already indicated, Heawood was by no means the first in this field. His work however stands alone in its scope and in the success with which he sifted and analysed the copious material. His ranging mind, retentive memory and cautious judgement contributed to the confidence with which bibliographers, students of early maps, and historians of the paper trade have learnt to use his results. Those concerned with early maps may in particular count it a fortunate chance (if chance it was) that so much of Heawood's source material was cartographic.

His own writings on watermarks clearly define the limitations, and demonstrate the possibilities, of this method when it is applied to maps and atlases. In determining the place and date of an impression from a copper-plate we lack some of the tell-tale clues offered by impressions from movable types. An early printer, anxious to distribute his types as quickly as possible after use, would reset them for a new edition of his text; but pulls could be taken from a plate many years after it had been engraved, without any alteration of the inked surface. During the copper-plate period in the history of map-making, the long life of plates was (as Fordham pointed out) a major factor tending towards inertia; for their proprietors continued to print from them for as long as possible, often without correcting the date or imprint.[1] To ascertain the sequence and approximate date of impressions we may be thrown back on other evidence: additions or changes in the geographical facts represented, the state of wear of the plate, the make of paper used. The evidence of the paper must be invoked with caution: it is, as Heawood points out, "collateral" evidence, and its successful application is conditioned by our ability to date the manufacture of the stock and to trace the trade channels through which it reached the printer. While it is true that makers' devices might remain in use for a number of years, Briquet showed that in his period their average life did not exceed 30 years, and Heawood's analysis has narrowed this span still further for later periods. The morphological arrangement of the two great specimen books enables us to study the progressive degradation and corruption of marks by wear and tear or imitation.

We are on less firm ground in deducing the place of printing, to which watermarks must be an uncertain guide. Here Heawood himself could make an incorrect inference from the material. His collection shows how native sources of supply were supplemented by imports from the mills of (successively) Italy, France, Holland, and again Italy.

Atlases present special problems, particularly where the engraved maps are backed by text. Heawood's demonstration of the original integrity of certain sixteenth century atlases, complied at Venice and similar to those of Lafreri, was (it will be recalled) founded on his study of their watermarks.[2]

No notice of Heawood's work would be complete without mention of the generosity with which he placed his knowledge at the disposal of others. Anyone who referred a difficulty to him could count on receiving a reply rich in information and argument; and after his death two large indexed sets of his tracings from watermarks were by his wish presented to the Society's library and to the British Museum.

R. A. SKELTON

[1] The most striking example of longevity in plates known to the writer is that of Saxton's large map of England and Wales. First printed in 1583, it was advertised for sale in the summer catalogue of Bowles and Carver as late as 1795.

[2] *Geogr. J.* 73 (1929) 358–69.

A NEW PLAN FOR THE CITY OF CAMBRIDGE

CAMBRIDGE PLANNING PROPOSALS: a Report to the Cambridgeshire County Council. By WILLIAM HOLFORD and H. MYLES WRIGHT. *Cambridge: University Press*, 1950. 12×9½ *inches. Vol. I the report*, XVI+72 *pages and appendices; Vol. II maps and diagrams.* 30*s*

IN THE INTRODUCTION to their report Professor Holford and Mr. Wright emphasize the special problem of planning Cambridge. They recognize that it is more than a town and that its tradition and peculiar amenities are of national or even greater significance. The growth and future size of the town they believe to be the determining factor in any plan "Function" might have been added, especially as Cambridge is described as "now perhaps the only true University town in England." The probability of rapid growth is considered the gravest problem, but traffic the most urgent. Traffic is certainly the most apparent problem but, as the proportion of through traffic is comparatively small, the volume of traffic is largely a function of the size of the town, so that the checking of its rapid growth may well be equally urgent.

The emphasis placed on the traffic problem finds its expression in the body of the report as the first half is taken up by a consideration of this problem and the new road proposals. It is followed by chapters on population, housing and livelihood, on the University and Colleges, and on the development of the centre of the town.

The traffic problem resolves itself into three main considerations, the future of The Backs road (Queen's Road), the routing of through traffic, and the relief of local traffic congestion on the "spine"—the almost straight route from Huntingdon Road in the north-west to Hills Road in the south-east. On the desirability of reducing traffic on The Backs road to a minimum there will be general agreement, though it is by no means certain that the "New West Road" proposals, as outlined, will have the desired effect. The recommendation that traffic regulations similar to those obtaining in the Royal Parks should be enforced on The Backs road has much to commend it. A section of a by-pass road to the east of Cambridge already exists and is incorporated in proposals for routing traffic between the south and north-east, but to the west of the town new proposals are made. A scheme for a western by-pass passing near Grantchester was dropped after the 1939 inquiry, and the new proposals are for a link between Chaucer Road and Barton Road, much nearer to the centre of the town. It might well be preferable to route traffic from the Shelford road via the proposed eastern routes and to take traffic from the Royston road well west of Cambridge, perhaps west of Harston. Such proposals are ruled out by the authors on grounds of expense; a good reason, but if Cambridge is of national importance perhaps it has a special claim for financial assistance. The proposal for relief of traffic on the "spine" is one of the most controversial. It is for a road from the top of Castle Hill to a new bridge midway between Magdalene and Victoria bridges and thence into Jesus Lane. From Jesus Lane a further road is proposed across Christ's Pieces to Emmanuel Street, and so into Regent Street. As outlined, the road includes three roundabouts, one almost large enough to be a one-way road system, three right angle turns, and two fairly sharp curves. This irregular route is due partly to a desire to skirt Christ's College garden and to minimize losses in Christ's Pieces. The authors realize the difficulties of the problem and of the

proposed route, and they acknowledge the sacrifices which would have to be made, but they see no alternative.

On the desirability of checking the growth of Cambridge the authors are emphatic and they recognize that a check can be applied only by a general agreement in which the government must participate. In their introducton they pose the question "can Cambridge control its own destiny?" This question is not directly answered by the authors, but in matters of population migration it is evident that it cannot. Here is another case in which local planning is handicapped by lack of a central policy on wider issues. In recent years the government has in fact made a substantial contribution to the growth of population in Cambridge by its choice of the town as a regional administrative centre. A significant point brought out in the proposals, on which comment is superfluous, is that in "the only true University town in England" national and local government employs nearly twice as many people as the University and Colleges.

The last section of the report is concerned with the development of the central area, the shopping area of the old town which is almost enclosed by University and College buildings. The authors have discarded all suggestions of road widening in this area as they consider it of special value and desire to see its character maintained. On this and their proposals for the development of the area between Petty Cury and Downing Street there will be little disagreement. The character of this central area however raises other issues. On the evidence of the typical barrier of bicycles on the curbs of Sidney Street, the siting of the large chain stores is a main cause of congestion, while their trade is not that characteristic of the central area. The authors do not discuss the possible removal of stores, but they do make the pertinent observation that "Nothing in planning has less hope of success than the attempt to remove the well-established shopping centre before the traders concerned have decided that it is in their interests to move." No reference is made to the possibility of using the New Square area. Emphasis however is placed on the importance of the adjacent Fitzroy Street as the second shopping centre of Cambridge, and the gradual southward and eastward movement of trade within the central area is also noted. This move is likely to continue as Cambridge expands to the east. The choice may well be that of removal now or further loss of character of the central area.

A further proposal will be the subject of much debate—the siting of a large bus station between Christ's College and the North Court of Emmanuel, immediately adjacent to the present terminal of many country bus routes. Cambridge is the centre of a considerable area for shopping, entertainment, and so on, and movement into the town for such purposes is considerable. The siting of a bus station can have a very marked effect upon shopping habits, but the report shows little appreciation of this fact to which only one very brief reference is made. It seems to be assumed that the present site is convenient, and no suggestion is made on the use of the siting of the new bus station, or of the routing of town buses, as attractions encouraging the redistribution of shops. The use of the New Square area again suggests itself.

The report is businesslike in its presentation of the main problems, and it is well printed and illustrated. Some of its proposals are, of course, very controversial, as any plans for the development of Cambridge as a whole are bound to be. They are matched perhaps only by Merton Mall in another place. But whatever the fate of the proposals, the report has done good service in emphasizing the urgency of the planning problem, in drawing attention to the need for a government policy, and in bringing to a wider notice conditions in that "other Cambridge" which lies between Christ's Pieces and the railway and is now rapidly expanding farther eastwards.

A. A. L. CAESAR

REVIEWS

EUROPE

DEVONSHIRE. By D. ST.LEGER-GORDON. (The County Books series.) *London: Robert Hale*, 1950. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* x+369 *pages; map and illustrations.* 15*s*

The arrangement of material in this series is diverse and in the present instance on Devonshire, described by the author as the fairest of England's western shires, it is definitely topical rather than topographical. Thus the chapters include such topics as archaeology and the antiquities of Dartmoor, Devon's distinguished maritime history, the former importance of the wool trade, mining and the stannary courts, farming, village life, hunting, folklore and the belief in sorcery; and as would be expected from the author's status as a naturalist, the flora and fauna. On the purely physical side the treatment is less thorough and there is no section specifically on weather and climate. The beauty of the deep river valleys and gorges of this green shire, the spell of Dartmoor and its bitter winds, and the deep remote solitude of eastern and northern Devon are portrayed with power, but the landscape of south-west Devon is hardly mentioned at all. Moreover the statement that the cliff scenery of the south coast entirely lacks the austere grandeur of the north coast might well be qualified by excepting the stretch between Start Point and Bolt Tail, where the dark mica-schists thrust out fierce fangs as rugged as the contorted grits and slates of the Hartland coastline. In regard to the vernacular it may be questioned whether a "Londoner who took up residence in the West would talk as such to the end" in view of the disconcerting and amusing facility with which cockney lads caught up the Devon speech during the late war.

Devonshire is erroneously stated to be exceeded in size only by Yorkshire, whereas in fact Lincolnshire comes second; and through what must be a printer's error the population of Exeter is given as only 1500. L. C. W. B.

THE MIDDLE SILURIAN ROCKS OF NORTH WALES. By P. G. H. BOSWELL. *London: Edward Arnold*, 1949. 9×6 *inches;* xvi+448 *pages; maps, diagrams and illustrations.* £4

In essence this is a geological memoir compiled in somewhat the same fashion as those of the Geological Survey of Great Britain, but lacking a complete geological map. It is the result of about twenty-five years of team work directed and energized by Professor Boswell from Liverpool University and later from the Imperial College of Science. The abundance of illustrative maps, diagrams and photographs is an outstanding feature of this compendious volume, and it will unquestionably become the standard book of reference on the academic and economic aspects of the geology of West Denbighshire and the adjoining areas of Carnarvonshire and Merionethshire. For the geographer it contains an enormous amount of data on geomorphological topics, soils and water supplies, while the town and country planners are richly provided with research material rarely available for other similar parts of Britain. The first section of the book is principally devoted to the earth-processes which governed the origin of the interesting sediments and sedimentary structures and the geological structure of the area. By careful study the somewhat monotonous succession of Wenlock and Ludlow grits, flags, siltstones and mudstones have been classified both lithologically, by using carefully controlled colour standards, and palaeonto-

logically by means of the well-known graptolite zones. In an endeavour to avoid controversy the geological facts are clearly set forth. On the other hand this monumental volume would have been considerably enlivened by further observations on the origin of the sedimentary structures which have made this area so celebrated among geologists to-day. Nevertheless Professor Boswell's vast knowledge of sedimentation has been embodied into this book to such an extent that it has really become a textbook on sedimentary petrology as well as a memoir on the geology of large parts of North Wales.

Last but not least, civil engineers interested in water supplies extracted from overground or underground sources will find in this book classic examples of scientifically evaluated projects, culled from Boswell's extensive practical experience as a hydrogeological consultant in the area. The all-embracing character of the book renders it difficult to assess but, although its high price will deprive it of a place on many bookshelves, as a work of reference it will be constantly sought after by geographers and engineers as well as by geologists.

W. D. E.

LA RÉPARTITION DE LA POPULATION SUR LE TERRITOIRE BELGE: étude de démographie sociale. By C. MERTENS. *Brussels: Société d'études morales, sociales et juridiques*, 1947. 9×6 *inches;* xviii + 302 *pages; maps.* 23*s*

As is perhaps inevitable with an essentially demographic work, most geographers will find this book appetizing and yet unsatisfying fare. Dr. Mertens is well aware of the geographer's way of approach to population and acknowledges his debt to Demangeon and J. Brunhes (whose name, incidentally, is misspelt throughout) and to Mlle. Lefèvre and others of the Geographical Department at Louvain. He wisely clarifies at the outset his own standpoint as a social demographer for whom population is studied as an end in itself, contrasting with that of the geographer for whom it is part, though how vital a part, of the human landscape.

The book falls into three main sections. A valuable introduction is followed by a descriptive account of population distribution based on the 1930 Census, the latest official source available at the time of writing; the 1947 Census results are only now beginning to appear. Dr. Mertens helps the reader with many vivid phrases and leaves a clear though generalized picture of a densely peopled centre surrounded by the sparser periphery of the Ardennes, the Northern Campine and the reclaimed polders around the Scheldt estuary and behind the coastal dunes. Brussels is said to be almost alone among European capitals in lying at the demographic centre of gravity; a radius of 60 kilometres from it encloses 25 per cent. of the national area, but 60 per cent. of the population. Attention is also paid to the general trend of population growth and distribution since 1880, which date is significant as marking the beginning of a declining birth rate as well as the remarkable growth of the Campine.

In the second section the author examines the economic and social facts revealed by this distribution and in the third discusses social and economic factors of the present pattern of population. As a moralist and a priest he is in sympathy with small cultivators and, while accepting that technical advance must continue to reduce in numbers those who find their main support on the land, he wishes to retain as many as possible on a part-time basis. Unlike some of his colleagues he does not regard towns (even in "Wallonia") as necessarily undesirable or demoralizing, but on balance he would prefer industry to penetrate the countryside rather than that countrymen should migrate to the towns or make long journeys to work.

Written essentially for "home consumption," this book is very far from parochial, and many in this country and elsewhere who are concerned with rural population problems will find in it much food for thought. Unfortunately there are few maps though many of the topics lend themselves admirably to map presentation. For example Appendix B, which lists the communes having a population below 10,000 and possessing at least one industrial establishment employing more than fifty persons, means little without a map. A specially valuable feature is the very comprehensive bibliography, in itself an ample justification for this stimulating book. S. W. E. V.

THE SOVIET UNION: the land and its people. By GEORGES JORRE. Translated by E. D. Laborde. *London: Longmans, Green,* 1950. 9×5½ *inches;* xviii+353 *pages; diagrams and illustrations.* 21*s*

This is the English version of a book already reviewed in the *Journal* (109 (1947) 240). The translation, by an experienced geographer, is almost a second edition since it has additional sections describing territories acquired by the Soviet Union at the beginning of the war.

The first half, dealing with the geographical background and the historical and economic development, is balanced and comprehensive, if "deterministic." There are chapters entitled "Agriculture on the eve of the German War," "Industry on the eve of the German War" and "Trade and Commerce on the eve of the German War," but the desirable sequel is lacking. Almost no reference is made to the effects of the war and the progress of rehabilitation. Good detailed regional descriptions occupy about 200 pages.

Statistics are used lavishly throughout, the latest dated 1941, and new maps and diagrams clarify the text although Figures 21 and 22 are rather small. An unfortunate interchange of Latvia and Lithuania occurs in Figure 17 while Figure 24 gives a misleading impression of the production of iron ore. The serious student may feel frustrated at the frequency of quotations from sources unspecified but bearing the authors' names, especially as many of them appear to be French.

The book is readable, well-illustrated and has a freshness of presentation. If it adds little to the factual material available in English on the Soviet Union, politicians and not geographers must be blamed. D. W. S.

ASIA

ASIEN. HOFFNUNG EINER NEUEN WELT. By A. ZISCHKA. *Oldenburg: Gerhard Stalling Verlag,* 1950. 9×5½ *inches;* 392 *pages; maps*

Mr. Zischka's latest book is the most important politico-geographical study of Asia to appear in Germany since 1945, and its value lies as much in the demonstration which it unwittingly provides of the mentality of liberal German intellectuals today as in the light which it seeks to shed on the contemporary Asian scene. The volume is well produced and the contents, including an extensive German, French, British and American bibliography, are remarkably up to date. The opening two chapters and the conclusion, together comprising about one-third of the book, are the most interesting, for it is in them that the author's challenging thesis is stated and elaborated. In the remaining sections, which deal severally with the problems of the major component regions of Asia, the treatment is less satisfactory and not infrequently marred by errors and inconsistencies.

Briefly, the argument, which is based upon a synthesis of continental European and Asian (especially Indian) concepts of the "third force," runs as follows:

The allegedly imminent collision between the two great powers, the U.S.A. and the U.S.S.R., is not inevitable, and the balance can be held by the series of lesser powers, occupying the potential "crush-zone" between. Here the initiative rests, on the one hand, with the West European states, and on the other, with the newly independent territories of Asia. The economies of these two groups are now more nearly complementary than ever before, and together this decisive middle tier contains far greater resources in both men and materials than either the Eastern or the Western bloc. Moreover, the spiritual resources of the older civilizations lying within this neutral zone should enable its peoples to give the world the moral leadership it so obviously lacks; and fortunately the preoccupation of the U.S.S.R. with problems of internal pioneering in Central Asia will provide a limited but, it is hoped, adequate breathing space during which this may be done.

Stated thus baldly, the policy advocated by Mr. Zischka would appear to be neither original nor convincing. But the arguments which he elaborates in its support, particularly in respect of the naturalness of north–south as opposed to east–west trade, and the detailed suggestions he advances concerning the industrialization of former colonial territories, undoubtedly merit consideration. Unfortunately, the journalist too often gets the better of the thinker, and it is difficult to believe for example, as the author suggests, that a revival of the Kra canal project would make a major contribution to the well-being of south-east Asia. Certainly the capital expenditure involved could be put to better use in land reclamation, the harnessing of water power, or the purchase of industrial equipment.

Throughout his book, Mr. Zischka makes frequent use of the major geographical literature on Asia, with which he is evidently thoroughly familiar. Significantly, although he discusses Mackinder's "Heartland" concept, he avoids reference to pre-War German Geopolitik and would, presumably, prefer himself to be classed among the exponents of Professor Griffith Taylor's "Geopacifics." Indeed as his chapter fittingly headed "The Antithesis of World Domination" indicates, he is concerned above all with the use of geographical potentialities for the furtherance of world peace. There remains nevertheless more than a trace of the Haushofer cast of thought, both in the extreme mistrust of British and American motives and in the elaborate webs of intellectual gossamer sometimes woven around simple arguments of sound self-interest. Thus the concept that Germany, purged of aggressive ambitions and true to her heritage of Goethe and Beethoven, is the European counterpart of China and India, with their age-long tradition of tolerance and compromise recalls, *mutatis mutandis*, the ingenious but unconvincing reasoning with which the author of 'Geopolitik des Pazifischen Ozeans' sought, a generation ago, to demonstrate the inevitability of a German–Japanese alignment. *Plus ça change . . .*? C. A. F.

THE MIDDLE EAST: a physical, social and regional geography. By W. B. FISHER. *London: Methuen*, 1950. $8\frac{1}{2} \times 5$ *inches;* xiii+514 *pages; maps and diagrams.* 27*s* 6*d*

Dr. Fisher has produced our first detailed geographical account of the Middle East as a whole. His book is a useful one, not for this reason alone, but because he has related the past and present activities of man to his environment in illuminating fashion. He has set out to emulate the French method in "intermingling history and geography." In this area, more than in most, this is a fruitful approach, and the author could with advantage have pursued his policy further. More penetrating and detailed regional historical studies would have

been valuable, whilst the facts of economic life and demographic trends might have been set in their relation to the historical background.

The writer of such a book as this has a difficult task, for he cannot be equally familiar with all the topics of which he has to treat. Dr. Fisher has faced necessities bravely, and dealt ably with the problems involved in the consideration of structure, climate, race and religion in this complex area. He has gone on to discuss historical and economic geography, and then to describe separately seven large regions. In such an all-embracing study it is inevitable that the reviewer should find sections where he would wish for different emphases or another treatment. Some errors must naturally creep in, but in the work under consideration more care could perhaps have been taken with phraseology and matters of detail.

One would wish further that Dr. Fisher had been more specific in his references and that he had given many more of them, for it is an important function of a book of this type to put the reader into touch with advanced and detailed work consulted by the author. It may be that the lack of references or acknowledgements in Dr. Fisher's best chapter, that on climate, is an indication of the originality of his material and treatment in this field. The work of one other writer, Combier, is cited and Dr. Fisher tells us that he had access to certain wartime investigations and research projects, but there is no indication of the origin of some of the data given, and no guidance to specialized reading.

'The Middle East' is a worthy addition to the admirable series of which it forms a part, and it is to be hoped that another edition will eventually be possible. N. N. L.

WELLS OF POWER. By Sir OLAF CAROE. *London: Macmillan & Co.*, 1951 $8\frac{1}{2} \times 5\frac{1}{4}$ *inches;* xx+240 *pages; maps.* 15*s*

"The Almighty has given into your hands the greatest of His ploughs." These words of Lord Curzon have been taken, in a slightly different context, as the author's thesis: Sir Olaf urges, in a study of marked breadth and discernment, that though the day of the British political officer in India is over, a comparable task awaits those now concerned with exploitation of the oil resources of south-west Asia. Here is a modern exposition of frank geopolitics, with strategic matters dominating the scene, and a backcloth of social life lightly sketched in. Within this framework Sir Olaf writes shrewdly of the clash of interests—American, British, French, Russian and local—with at the same time more than a touch of literary allusion. He gives a thoughtful commentary on the present state of Arab society, ossifying under the impact of the West—"privileges [become] legal rights; duties are too often forgotten"; and his pages have many telling phrases such as that on Iraq—"a conglomerate, untested and untried . . . selected as the keystone of the [Middle East] arch."

Those readers who desire a more technical and detailed exposition of actual oil resources and their development will read 'Wells of Power' with less profit. The author is concerned more with politics, so that economic and factual geographical details emerge only incidentally; and there is difficulty in obtaining any clear picture of facts of topography and structure. As a result, when concerned with the oilfields themselves, Sir Olaf's survey is in places incomplete and diffuse. It is in appraisal of social movements and long-term political trends that the book is most useful; and within these limits one can find much to ponder—the problems of Communism, social upheaval and power politics in a rapidly altering environment. Sir Olaf's plea for a regional system of allocation of the profits from oil exploitation comes in particular at a singularly timely moment. W. B. F.

STATISTICAL ATLAS OF BOMBAY STATE (Provincial Part). 4th edition. *Bombay: Bureau of Economics and Statistics*, 1950. 13×9½ *inches;* v+228 *pages* (plus supplement of 59 pages); *maps and diagrams. Rs*40

After an interval of twenty-five years this atlas is now being republished in two parts. The Provincial Part, with districts as the basic unit, treats "Bombay Province" as it existed before the recent mergers of the Indian States. The District Part, giving information about each *taluka*, has been postponed until comparable data become available for the new "Bombay State." The atlas is divided into four sections dealing with geographical features, agriculture, industrial development, and demographic and social trends. There is a lengthy text and a profusion of fascinating tables and appendices; indeed the 49 maps are almost submerged.

The first part includes valuable sections on the climatic sub-types of Western India, and on the geographical regions of Bombay—of which 30 are distinguished. An appendix contains monthly rainfall data for 220 stations. The tables are necessarily based on administrative boundaries, and it is therefore refreshing to find that the editors recognize that these seldom coincide with geographical regions. The agricultural part is both comprehensive and well balanced. It contains crop distribution maps for the season 1943–44; and deals fully with seed varieties and methods of cultivation, floods and famines, forestry and land tenure. Elaborate tables show the distribution of irrigation, livestock, land revenue, etc., while a supplement lists the acreages of a score of crops for the season 1948–49. The forestry and irrigation statistics are misleading; the former obscure the difference between the extent of systematic forestry and the much larger total forest area. Conversely the economic significance of canal and tank irrigation is far greater than the tables suggest. The great reservoirs in the Western Ghats are barely mentioned, and a map showing these and the pattern of irrigated land would form a valuable addition. The treatment of Bombay's industrial and social economy is less happy. The 1941 Census of India and the 1946 Census of Manufactures are the main sources, but distributional patterns are often obscured by the administrative-cum-fiscal nature of much of the data.

Technically the atlas is well produced. The crop distribution maps would be immensely improved if drawn on a blue base map showing rivers, canals and towns; while some maps seem wastefully empty. An important omission is the absence of any maps showing road and rail traffic patterns; full data may not be available for road traffic, but one suspects that rail traffic is excluded simply because it is not a Provincial responsibility. However there is one much larger question. Should a work of this kind be an atlas; or should it be a statistical digest with a few illustrative maps. The present volume is a compromise. It might be more satisfactory to publish in one volume a full set of maps with a limited text, and in another volume statistical tables and appendices.

India is almost unique in the scope and details of its rural statistics and the serious geographer will find this atlas a mine of information about one of the most varied and fascinating parts of Asia. J. M. R.

AFRICA

EAST AFRICAN AGRICULTURE. By J. K. MATHESON and E. W. BOVILL. *London: Geoffrey Cumberlege, Oxford University Press*, 1950. 8½×5½ *inches;* xvi+332 *pages; maps and illustrations.* 25*s*

The editors, who are "the two heads of a commercial organization of a predominantly agricultural nature and covering almost every form of husbandry

practised by the European in East Africa" have sought the collaboration of their friends and colleagues in the production of this book. They advance only modest claims for it; but the present reviewer has found much of geographical value within its covers. In an otherwise not very strong Introductory Part, the outstanding contributions are a brief summary of the climate of East Africa from the East African Meteorological Department and a chapter in which Mr. Colin Maher writes on the "Conservation of land resources in Kenya." Part Two, "European agriculture," deals with the main concern of the book. Here, as the major crops are in turn considered, there emerges a picture of the concrete results of the efforts of half a century, including the considerable achievements of the period 1939–45, and of the burden which has thereby been imposed upon the soil. Four chapters on African agriculture in the respective territories of East Africa—Kenya, Uganda, Tanganyika and Zanzibar—are grouped together in Part Three; here Mr. Fergus Wilson's essay on peasant agriculture in the chapter on "Agriculture in Zanzibar" displays a fine geographical sense. Outside these specifically "African" chapters, there is a tendency on the part of some contributors to underestimate the value of the African as a collaborator in European and, by implication, Indian agriculture.

S. J. K. B.

LE VIE DELLA SETE. By A. Desio. *Milan: Ulrico Hoepli*, 1950. 10×7 *inches;* viii+336 *pages; maps and illustrations*

Desio's work on the geography and geology of the Libyan Sahara has been well known for years in scientific and technical publications. In this volume he writes an account of several journeys done before the war using camels, motors and aircraft in various parts of this former Italian colony. Though intended as a travel book it contains a good deal of interesting data presented in readable form and is profusely illustrated with magnificent photographs. The maps are unfortunately deplorable. They consist of outline sketch-maps illustrating the various journeys and only one very poor map of the Sahara as a whole. As in so many Italian books there is no index and only a very cursory table of contents. This makes the book much less useful than it might have been for all the valuable information about the area round the Wau group of oases and the area north of Tibesti. These parts of Libya, almost the only ones which did not become comparatively well known during the war, still contain a great deal of new material for geographers and geologists alike. Desio's examinations of the volcano craters at and near Wau el Namus and of the lava field near El Fugha, with their accompanying photographs, are particularly remarkable.

R. of R.

NO WOMAN'S COUNTRY. By Michael Langley. *London: Jarrolds*, 1950. 9×5½ *inches;* 221 *pages; end-paper map and illustrations.* 15*s*

Michael Langley travelled over much of the Sudan during the nine months that he was in the country. He travelled indefatigably by plane, train, steamer and motor and his publishers claim that he covered 10,000 miles. This gives some indication of the vast size of the Sudan. He visited Darfur, Kordofan, the three Southern Provinces, the Gezira, Kassala Province, and Khartoum, Omdurman, Atbara and Port Sudan. A description of the innumerable places he visited, the people he met, British officials, Sudanese officials, effendis, merchants, townsmen, cultivators, nomads, negroes and arabs, and the impressions he formed of it all is condensed into 220 pages. The reviewer sometimes wished that he had been a little less energetic, or travelled for a short time by more leisurely and old-fashioned means so as to give both himself and his readers a well merited rest. The author was much impressed by the great work which British

officials have done in the Sudan since they took over the bloodstained ruins of the Mahdist Empire fifty-two years ago, and he discusses at some length the task which they have set themselves to-day of transferring power to the Sudanese. His photographs give a good impression of the varied types of people and scenery to be met with between Wadi Halfa and the extreme south. The title seemed to the reviewer to be a stupid one. Michael Langley seems to have chosen it because he, like everybody else, disapproves of the pharaonic circumcision which is performed on some of the girls in the Northern Sudan.

W. T.

DIE GROSSE RANDSTUFE AUF DER OSTSEITE SÜDAFRIKAS UND IHR VORLAND. By E. OBST and K. KAYSER. *Hanover: Geographisches Gesellschaft zu Hannover*, 1949. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; 342 pages; maps diagrams and illustrations*

This book contains a careful, and in parts detailed, study of the Great Escarpment of South Africa, that major topographic feature which separates the interior plateau from the lower peripheral regions. The field work was done by Obst (1932–33) and by Obst and Kayser (1935–36), and although their work was almost complete in 1939, its publication was prevented by the war.

The book opens with a geographical description of the route covered; this is followed by a statement of the main problem of the origin and development of the Great Escarpment and by a summary of the conclusions of previous authors. The main treatment of the subject follows and is concluded by a generalized statement of the land surfaces of the foreland. These land surfaces are mapped, and a triple succession appears at elevations of 950–1200 m., 500–700 m., and 250–300 m. which, with the geological structure, gives a stepped character to the foreland country.

Like others, the authors were misled in certain of their datings of these surfaces by Veatch's (1935) mistaken correlation of the great African plateau surface with the sub-Miocene surface of the Angola coastlands, instead of with the sub-Cretaceous; the section on the dating of land surfaces suffers in consequence. Only Jessen (1936) among geologists has failed to make this mistake in recent years.

The section on earth movements is good, though their role in the modern landscape is somewhat over-emphasized according to the views of present workers. The authors also consider a tropical environment to have been important in landscape-making; for instance in the production of inselbergs, a view that is now little held. In several such respects the work "dates," for the authors show no acquaintance with the many important researches into South African geomorphology published during the last decade. But their work remains a most useful contribution to the literature of African landscape.

L. C. K.

AMERICA

CLIMBS IN THE CANADIAN ROCKIES. By F. S. SMYTHE. *London: Hodder and Stoughton*, 1950. $9 \times 5\frac{1}{2}$ *inches;* ix+260 *pages; maps and illustrations.* 20*s*

The reputation of Frank S. Smythe was world wide. No other mountaineer has been so prolific a writer and few travellers have appealed so strongly to the general reader. Smythe had the art of bringing vicariously the thrill of mountaineering to people who had never stepped on to a glacier. It was inevitable that by catering for this wide public, he should sometimes earn the criticism of other

climbers and explorers; but in his mountain photography was an achievement equally acceptable to all.

His last book, posthumously published, displays his gifts admirably. He recounts the experiences of several seasons in the Canadian Rockies, which included a visit to the unexplored Lloyd George mountains. The reader is given a vivid impression of the arduousness of the approach to these mountains and of the enjoyment of the climb when he at last reaches the snow. Descriptions of wild life and of flowers add variety to the narrative and one would look far to find so colourful a picture of the region.

Sometimes, unfortunately, Mr. Smythe's enthusiasm for mountains was equalled by the strength of his prejudices and the book contains, in the reviewer's opinion, an unfortunate passage abusive to those who climb with pitons. The implication that cowardice motivates the climber who uses these aids was unworthy, and will displease many even among those who share to the full his dislike for artificial climbing.

The forty-three illustrations provide an admirable example of Smythe's gift for revealing the moods not only of mountains but also of the men who climbed them and of the wild life in the surrounding valleys. R. S. R.

WATER, LAND AND PEOPLE. By B. Frank and A. Netboy. *New York: Alfred A. Knopf*, 1950. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xviii+331 *pages; illustrations.* $4.00

This is an American book about America. On the same lines as earlier works by Shepard, Vogt and Osborn, it comes at a time when the wastefulness of the Second World War and the new demands of rearmament and foreign aid are compelling Americans to realize that their resources are not unlimited.

'Water, land and people' is written in a somewhat staccato, though readable, style; impressive statistics are liberally scattered throughout and references are made to numerous publications of very variable quality, many of them not easily accessible to the English reader. In presenting an elementary introduction to the problems, the early chapters attempt to show that "there is no need to be an expert to appraise intelligently the broad relations between climate, soils, plant cover and water flow, and especially the harmful consequences of misusing the land."

The later chapters, telling of the rivalry between the various Federal agencies in their desire for power and prestige, are of greater interest. Mr. Frank is a member of the U.S. Forest Service, and his co-author has had experience in that service and in the U.S. Bureau of the Budget. They feel strongly that the Army Department has acquired too much control over river development. "The worshipful reliance in the U.S.A. on dams and reservoirs reflects a philosophy that lays undue stress on immediate values at the expense of obligations to future generations." Colossal dams have been constructed, but fisheries have suffered, watershed management has been neglected and reservoirs have silted up. Lack of coordination between the Corps of Engineers and the Bureau of Reclamation in the Columbia and Missouri valleys has led to serious waste of money and resources. In a brief up-to-date assessment of T.V.A., it is recognized that great progress has been made and that much of this cannot be measured in terms of dollars. Nevertheless, it is considered that watershed management has received insufficient emphasis in the Valley and rural poverty is still said to exist, away from the main highways.

Despite the spending of hundreds of millions of dollars, floods, siltation and contamination do not seem to have been perceptibly reduced over the country as a whole. The solution to the natural-resource problems is seen to lie in dealing with the causes rather than the symptoms. Information is required in

the form of maps and records of precipitation and run-off; a nation-wide educational programme is called for, and a centralized agency to deal with all aspects of water resources. More important is the view that misuse of watersheds will require such control of private property as has not yet been undertaken in the United States.

The questions remain as to how far national interests are to be placed ahead of those of the individual, and to what extent legislation is capable of counteracting the effects of a *laissez-faire* economy and social irresponsibility.

A. T. G.

PHYSICAL GEOGRAPHY

ESSAIS DE GÉOMORPHOLOGIE. By HENRI BAULIG. (Publications de la Faculté des Lettres de l'Université de Strasbourg: Fascicule 114.) *Paris: Société d'Édition: Les Belles Lettres*, 1950. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* x+160 *pages; diagrams.* 550 *Francs*

The essays collected together in this volume (but not the notes, which are often long and most helpful) have all been published elsewhere. They have been chosen by a group of Baulig's pupils and represent an admirable cross-section of his work and thought in the domain of geomorphology.

Baulig's work has always been distinguished. Some readers may be more familiar with his two volumes on North America in 'Géographie Universelle,' and others with his 'Plateau Central.' Nevertheless the many papers he has written in *Annales de Géographie* and other periodicals are probably most representative of his contribution to geography. Those assembled in this book will give the student an excellent sample of his methods and lines of thought.

Two of the essays are concerned with people—Hutton, Playfair and Davis. Together they afford an interesting historical background not only to the other essays, but also to geomorphology in general. There is an appraisal and criticism of Davis's work, and a careful analysis of his influence in different countries. The place of geomorphology in America is of course different from that in Europe. In the former it has reverted almost wholly to the geologists, whereas on the Continent and in Britain "Les géologues, d'ailleurs sollicités par d'autres problèmes, ont montré peu de goût pour des études qu'ils jugeaient aventureuses, trop éloignées des faits 'tangibles' et au total de mince importance." At the same time, as Baulig himself has often demonstrated most effectively, geomorphological methods may be of great help in the unravelling of geological problems!

The other essays deal with the different kinds of problems on which Baulig has worked from time to time. That on the profile of equilibrium of rivers in different climatic regions, followed by discussions on alluvial cones and pediments, is in itself a short but useful symposium. Quite apart from their significance in this book, it is convenient to have these particular papers and notes brought together in one place. The essays on the equilibrium profiles of slopes, river captures, matters of terminology, the Crau and its relation to the Würm glaciation, the Dalmatian coast, and on the fundamental concepts of geomorphology will be remembered by many students. Their individual worth is considerable, but here they enable the reader to appreciate the nature of Baulig's place in our subject. There is also a full list of his written works, and an interesting introduction by nine of his former pupils, all now well-known names in the geographical world.

All geographers will welcome this volume. The papers are carefully chosen to give a good idea of the range of work of their author, and also to illustrate

his outstanding ability in his own field. He himself, partly in a short preface, partly in the essays and notes, pays full tribute to his predecessors and his colleagues in France and in other countries. The volume marks his retirement from active university life. Remembering his sufferings during the war and their effect on his health, all who know him or his work will wish him a long and well-merited rest from official labours: but it is not unkind to hope that he will still find the time and circumstances in which to enrich our subject with new contributions. J. A. S.

A PRACTICAL HANDBOOK OF WATER SUPPLY. By FRANK DIXEY. 2nd edition. *London: Murby*, 1950. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xxxvi+573 *pages; maps, diagrams and illustrations.* 35*s*

The first edition of Dixey's book was published in 1931 at 12*s* 6*d*, and all those directly concerned with the subject quickly learnt to appreciate it. Probably the war compelled many more to realize that water supply may often be a serious problem. Sites for factories, airfields, camps and even satellite towns have been chosen without any regard to an adequate supply of water, on the naïve assumption that a sufficiently wide and deep well would everywhere yield the amount required. In some instances a difficult problem was successfully solved, but in many cases a fresh site had to be found.

A new edition of this comprehensive work is therefore most welcome; but unfortunately the book as it now stands should be described as a re-issue rather than a second edition. At the end of each chapter a short list of additional references has been added; otherwise almost the entire book is repeated line for line, alterations being insignificant. For example on page 493 (systematic investigations) "are of somewhat recent growth" replaces "are only just beginning," but in the same paragraph "the next few years will necessarily witness . . ." is left unchanged.

The years 1931 to 1950 have shown great advances in nearly all the subjects dealt with in the various chapters. In engineering new methods have been developed both in the construction of dams for water-storage and in the boring of wells to obtain supplies from underground. On the quality of water there is no mention of the fluorine content; the great amount of work on this subject in the United States, Britain and North Africa, in fact almost all over the world, should certainly be discussed, while mention should be made of the difficult problem of the variation in iodine content. On water-finding a completely new section on geophysical methods is needed; while on the controversial subject of water-divining the valuable comparative figures obtained during the North African campaigns should certainly be included.

The illustrations are identical with those in the first edition; in many cases, particularly those on pages 221, 361 and 457, the blocks are seriously worn and the results blurred.

It is to be hoped that Dr. Dixey, perhaps with the aid of collaborators, will be able shortly to produce a really up-to-date edition of his excellent handbook to replace the present make-shift. C. N. B.

MARINE GEOLOGY. By PH. H. KUENEN. *New York: John Wiley and Sons (London: Chapman and Hall)*, 1950. 9×6 *inches;* 568 *pages; maps and diagrams.* 60*s*

For many years Dr. Kuenen has been a foremost authority on coral reefs, submarine canyons, and other physiographical and geological features of the ocean basins. It is therefore with no little pleasure that we welcome this volume which deals comprehensively with many subjects conveniently brought together for the first time.

The title 'Marine geology' should not divert the attention of geographers. Without in any way entering upon a discussion of definitions, it is important to emphasize that a great deal of the material dealt with is essentially physiographical and should be studied by all who are interested in physical geography. It is significant that the first ninety pages contain a most useful summary of such matters as the composition and properties of sea water, sea ice, and of the various movements of the oceanic waters. This insistence on an appreciation of an up-to-date background of physical oceanography is both interesting and valuable.

As might be expected, the author discusses fully the origin of deep sea depressions, and in the light of his work on the Snellius expedition he is not content with a purely theoretical approach. The analysis of the sources and means of transportation of marine sediments, considered later in relation to formation of the deposits made by them, is very thorough. Kuenen is not satisfied with generalizations, but examines various environments in association with the sedimentation taking place in them. Deltas, lagoons and tidal flats, as well as pelagic areas, are studied. Moreover, there is an analysis of the movement of beach material and some attention is also given to shore forms. Not merely because of his personal predilections, the reviewer would have liked to see rather more attention given to beaches, marshes, and tidal flats. The intricate mixture of coarse and fine sediments, some windborne, some the result of powerful wave action, and others testifying to the steady accumulation of fine sediment, is too often either overlooked or but casually mentioned in text books. In nature such modern deposits illustrate extremely well one of the ways at least in which the production of sedimentary rocks of very variable facies is achieved.

The nature of stratification in relation to supply of materials and place of deposition, the light thrown on this matter by deep sea cores, the rate at which deep sea sediments accumulate, and estimates of the total volume of such deposits are all discussed. The chapter on coral reefs, while including some account of the theories of reef formation, perhaps directs more emphasis to the nature of sedimentation on and around reefs. It is true that this aspect of the coral problem has become more evident in the last two decades, but it is useful to find it treated in a book such as this. The importance of *Lithothamnion*, the cementation of beach deposits in coral seas (a matter which might perhaps have received somewhat fuller treatment), the erosion of coral limestone, the shapes of coral reefs and islands, and the all-important influence of recent and minor changes of sea-level are among the items dealt with.

The final chapters are concerned with submarine canyons and major eustatic changes in sea-level. The author's own work on the turbidity current hypothesis is well known, but it is worth while quoting his concluding paragraph—"The main point of doubt is whether the rocks forming the continental terrace are so poorly consolidated that they can have been swiftly eroded by currents of a few metres per second. This doubt is so serious, in view of the many places in which hard rock has been encountered on the canyon walls, that the hypothesis of turbidity currents cannot be definitely accepted, in spite of its many outstanding merits. But the swiftly accumulating mass of data may bring conviction one way or another in the near future." This balanced outlook characterizes the whole work and gives the reader the assurance not merely that he is reading the work of an authority, but of one who is also presenting his material with complete fairness. It is a book of high merit and should find its place in the libraries of all interested in physical geography, geology, and related sciences. J. A. S.

THE ELEMENTS OF FIELD GEOLOGY. By G. W. HIMUS and G. S. SWEETING. *London: University Tutorial Press*, 1951. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+268 *pages; maps, diagrams and illustrations.* 12*s* 6*d*

"Geology" said Darwin, recalling perhaps his own introduction to the subject under Sedgwick in North Wales, "is a capital science to begin, as it requires nothing but a little reading, thinking and hammering" and it is with this encouraging quotation that the authors begin their handbook. There is "a little reading" in Chapters 3, 7 and 10, which epitomize what may be found in other books on general geology and the interpretation of geological maps. Far more valuable are the chapters that deal directly with work in the field, though their detailed treatment of a small area in Derbyshire does not make for readability. Here the attributes of idealized structures are left behind and the map and its interpretation develop as the exposures in rock face and roadside are described in turn. They might have encouraged Darwin himself, who suspected before he set out for Wales that "the first expedition I take, clinometer and hammer in hand, will send me back very little wiser and a good deal more puzzled than when I started." It is assumed throughout that the reader is working with a 6-inch map and, now that there are so many opportunities for field work in less developed lands, it is a pity that there is not at least an appendix on geological reconnaissance where the map, if there is one, is more rudimentary. Yet the relations of geology to land form and ecology, and the value of a general view, are not forgotten. The preference of adders for sandy soils, noted on page 50, is perhaps rather a refinement of diagnosis.

The book also contains tables for the identification of minerals, rocks and fossils. For minerals and rocks they do not depart from those in other books, but the dichotomous key to the principal genera of invertebrates (and a few plants) is a new departure in this country. It is not claimed that the key will provide the degree of identification that is necessary in stratigraphy, but with it the beginner should gain confidence from knowing what he is collecting and narrow the field for subsequent comparison with museum specimens.

Perhaps because it is the work of two authors, there are not a few repetitions in the text and something has gone wrong with the arrangement of the paragraphs on page 43. F. G.

SYMPHONY OF THE EARTH. By J. H. F. UMBGROVE. *The Hague: Martinus Nijhoff*, 1950. 9×6 *inches;* xi+220 *pages; maps, diagrams and illustrations.* 11 *Guilders*

Professor Umbgrove needs no introduction to geographers and geologists in this country. His visits and lectures are always enjoyed, and there are few who can so competently address a meeting, or write a book, in a language other than their own.

The present volume consists of a series of essays or lectures on subjects which together form a symphony. The first chapter deals only with broad outlines, skilfully introduced by a consideration of the Mythen rocks, near Lucerne, which are provocative of theories of Alpine structure. This is followed by a fascinating chapter on the geological evolution of Holland, a subject at first sight so different from the remainder of the book as to suggest that the music is either flat or discordant. But we see that these clays and sands are merely an incident in the long process of filling up the North Sea basin. We are soon back in the depths, and not surprised to find that the next movement is like a scherzo with two contrasted themes—a lively one concerned with the superficial folding in the Jura mountains, and a more serious one of Alpine tectonics.

They are linked by a study of the Molasse—and why it has not been involved in the folds on either side.

The transition from Alpine structures to oceanic furrows and geosynclines in the East Indies and elsewhere is direct, but before long we are discussing the roots of mountains and geophysical speculations. Mountains and volcanoes are close relations, so that it is not surprising that we next find ourselves at the Eremo inn on Vesuvius, discussing the origin of that and other cones. But our visits on the surface are short, and once again we go below to try to understand the origin of granite. Many will find themselves in sympathy with *Hic academicus* in Dr. Gilbert Wilson's drawing on page 141. In the last chapter the author meditates on life and its evolution and presents a masterly summary of modern views which forms a fitting finale.

The book is one to read and think over. The specialist will find parts of it are familiar, but few if any will find all of it a normal part of their everyday intellectual diet. It is clearly and concisely written, it is full of ideas, up-to-date, cleverly illustrated, and to be recommended to all who are interested in the Earth. J. A. S.

MATHEMATICAL GEOGRAPHY

KARTOGRAPHISCHE NETZENTWÜRFE. By KARLHEINZ WAGNER. *Leipzig: Bibliographisches Institut*, 1949. 10×7 *inches; 262 pages; maps and diagrams*

This book gives in precise detail much information on map projections that is not readily available in the English language. Dr. Wagner's work is obviously the result of much practical experience and although a certain amount of higher mathematics is omitted, those points which are of practical significance are emphasized and made clear to the reader.

The work forms a most interesting and instructive guide for those teaching and studying map projections, and especially those of importance for the geographer. The projections are well illustrated and the diagrams are clear and concise; the methods of computation are shown clearly, while the tables of *Azimutale Koordinaten* are very complete and of permanent value. The author's approach to his subject is quite different from that normally found in English text-books, and cartographers should find this volume of considerable use.

E. A. M.

ECONOMIC AND SOCIAL GEOGRAPHY

AN INTRODUCTION TO SOCIAL ANTHROPOLOGY. Vol. I. By RALPH PIDDINGTON. *Edinburgh: Oliver and Boyd*, 1950. 9×5½ *inches;* xxvi+442 *pages; maps, diagrams and illustrations.* 25*s*

This introduction to social anthropology is intended as a text-book for the undergraduate student who approaches the subject as a novice. While American anthropologists such as Boas, Kroeber and most recently—Herskovits have produced a number of excellent works on general anthropology, there has for many years been no text-book from the pen of a British anthropologist and for this reason Piddington's work is assured a wide circulation among university students. Yet, unlike Herskovits' 'Man and his works,' it is not a comprehensive survey of the results and problems of modern anthropology but a detailed exposition of one particular method of investigation.

The most successful chapters are those on social organization, in which the basic systems of kinship and marriage and the methods of field investigation by means of genealogies and charts are set out systematically and lucidly. In

the subsequent chapter on "The principles of cultural analysis" the author follows Malinowski's functional theory of culture without much addition or modification. His contention that certain customs and institutions which cannot satisfactorily be explained by functional methods are "atypical and abnormal" would be more convincing if he had been able to show by what criteria "normal" and "typical" cultural features can be recognized. The limitations of Piddington's approach become apparent when he deals with the problem of variations and differences in individual cultures. He rejects the concepts of culture-trait, culture-complex and culture-area as classificatory devices and considers the study of diffusion and subsequent interaction of cultures as sterile and unscientific; but there is little comfort in his own conclusion "that there is no really satisfactory way of classifying human cultures."

The weakest part of the book however is what the author calls "A Cook's tour of primitive peoples." While it is certainly difficult to give in seventy-five pages an adequate conspectus of the primitive populations of the world, a somewhat more balanced presentation could have been achieved. Failure to correlate cultures with geographical environment and to outline the historic events which resulted in the present-day distribution of peoples and cultures leads to a picture in which individual tribes appear suspended in a void with no indication of their position in the general cultural and ethnic pattern of a continent. In the section on India, for instance, the author describes a few small tribes, numbering no more than some hundred individuals, but does not mention the existence of aboriginal peoples with a numerical strength of two and three millions. References to "the so-called Dravidians or Proto-Australoids of Southern India" are meaningless, for in modern usage the term Dravidian is exclusively applied to a group of languages spoken by a variety of populations ranging from primitive jungle-folks to the heirs of great historic civilizations, whereas the term Proto-Australoid, used as an alternative to Veddoid, designates a very primitive racial type surviving in India among certain tribal populations not all of which speak Dravidian languages. Any original connection between the Proto-Australoid type, which must have developed in palaeolithic times, and the Dravidian languages is highly unlikely. It is equally meaningless to suggest that the Dravidians resemble the Lepchas of Sikkim "in that they form a distinctive cultural enclave isolated from the dominant cultures of India"; for some seventy million speakers of Dravidian languages constitute the predominant population of Southern India and a bulwark of traditional Hinduism.

Despite such inaccuracies in the presentation of ethnographic data and a somewhat dogmatic insistence on the functional method as the only "scientific" approach to anthropological problems, the book has its merits as a readable elementary text-book. We may perhaps hope that the second volume will give the reader a broader view of the development of anthropological thought since the death of Malinowski. In Britain as well as in other countries there have been considerable advances in the formulation of concepts and techniques, and even the student reading for his first course in anthropology should realize that there are more ways than one to the understanding of human culture.

C. F.-H.

MODERN COLONIZATION. By R. J. HARRISON CHURCH. *London: Hutchinson's University Library*, 1951. $7\frac{1}{2} \times 4\frac{1}{2}$ *inches;* 165 *pages; sketch-maps.* 7*s* 6*d*

In the introductory chapter of his book, Mr. Harrison Church says that the "geography of colonization deals with the geographical aspects of colonial contact" and explains that his aim is to study the effects of the contact between

colonizers, bringing with them their own ways of life, and the indigenous peoples carrying on with theirs. The study is thus one of relationship and of resultant change; of watching a river deflected from its course and flowing through other regions, and by this very fact making other landscapes. And, because Mr. Harrison is primarily a geographer, his study is both physical and social and concerns the actual alterations of physical environment as well as the metaphorical fresh fields and pastures new brought about by the impact of expanding civilizations on what, at any given time, were undeveloped or declining continents and areas. In a short book Mr. Harrison Church has done no more than indicate the possibilities of this vast theme and has given provocative examples drawn from every continent, from the work of every modern colonizing people, and from all periods of modern history, to illustrate his points. His section on "The influence of colonization upon the physical environment" discusses both the contributions and the irrevocable mistakes of colonizing powers in a stimulating manner, and his chapter on "Colonial transport" with its maps (particularly the section on West African port development) is a good instance of the contribution colonial geography has to make to knowledge. As a whole however the book is disappointing. It promises a study of the effects of the arrival, settlement and work of peoples in continents, climates and communities foreign to them, yet the major resultant problem in "colonies of settlement," generally known as that of the "plural society," is not thrown into relief. One looks in vain for a contribution to the study of Malays, British and Chinese in Malaya; of Africans, Europeans, and Indians in East Africa; of Berbers, Arabs, and French in North Africa; of Kazakhs, Uzbeks, Russians and Ukranians in Central Asia; or for a comparative study of colonial town development and reference to the several surveys of colonial centres of population (except for the Ashanti survey by Mr. Steel) of recent years. This seems partly to be because the book tries to cover too much. While it is exciting to read about Marco Polo, the Treaty of Tordesillas, the Chinese in Java, the Jews in the Palestine of 1944, and the "scramble for Africa" after 1885 all in one short book, Mr. Harrison Church would have made a far stronger case if his study had been confined to one continent, preferably to Africa. Casting his net too wide, both geographically and historically, he both confuses the reader, and risks inaccuracies and omissions which tend to prejudice the reception of his book. (For example, under the Malayan Federation of 1948 there is a common citizenship for the Malayan Federation only, not for Malaya and Singapore; in his discussion of Eritrea and Ethiopia one misses any reference to M. Perham's study "The Government of Ethiopia.")

Finally, as an amendment to the appendix, it may be mentioned that Colonial Geography has been included as a special subject of the Honours School of Geography at Oxford since 1947, and that an Institute of Commonwealth Studies has been established in London University, and an Institute of Colonial Studies at Oxford. M. H.

GENERAL

LONDON ESSAYS IN GEOGRAPHY. Rodwell Jones Memorial Volume. Edited by L. DUDLEY STAMP and S. W. WOOLDRIDGE. *London: Longmans, Green and Co.*, 1951. 9×5¾ *inches;* xiv+351 *pages; sketch-maps and diagrams.* 25*s*

This book has been prepared as a tribute to the memory of Professor L. Rodwell Jones from his former pupils and colleagues. The seventeen essays which make up the volume have all been written by former students of, or teachers in, the

King's College and London School of Economics Joint School of Geography. Professor Rodwell Jones, who held the chair of Geography at the London School of Economics for twenty years (1925–45), was largely responsible for organizing this joint school; it was established in 1921–22 when Sir Halford Mackinder was still head of the Department of Geography at the London School of Economics.

Memorial volumes often have little unity and coherence and this is no exception. Valuable papers are even more obscurely buried in works of this kind than in periodicals, as each chapter is not always listed separately in bibliographies and indexes. The essays in this book include two inaugural addresses, Professor L. D. Stamp's on "applied geography" (1946) and Professor S. W. Wooldridge's on "the role and relations of geomorphology" (1948). The fact that the book contains essays on such diverse subjects as "climatic classification" and on "the development of the Northamptonshire iron industry, 1851–1930," both admirable pieces of work in their respective fields, proves the inevitably disjointed nature of the volume as a whole. It should be pointed out however that at least nine of the essays deal with topics concerned with economic geography or the historical aspects of that subject, and this is perhaps in some measure a reflection of Professor Rodwell Jones' main interests.

The only controversial essay is that by Professor G. H. T. Kimble on "the inadequacy of the regional concept." This direct but rather shallow attack on the idea of the region will arouse much argument and discussion. The theme is important and worthy of a more philosophical treatment than that given to it by Professor Kimble; it is particularly unfortunate that the essay bears evidence of very hurried writing. Professor Kimble's journalistic style is in marked contrast to Professor D. L. Linton's in his lucid and valuable paper on "the delimitation of morphological regions," which is bound to help any student of the idea of the region, whatever his angle of approach.

An appendix gives a list of the students in the Joint School of Geography from 1921 to 1947. The introduction includes a brief and rather inadequate account of Professor Rodwell Jones' life and work. A longer and more personal appreciation of Rodwell Jones, with a fuller account of his career and teaching, a bibliography of his published work and perhaps a portrait, could have found their way into this volume. Professor Rodwell Jones himself delivered a stimulating inaugural address on 14 October 1925 and this paper might well have been reprinted; its sound comments on historical geography have had considerable influence. The authors of the introduction to 'London Essays in Geography' could have drawn a clearer and sharper picture of Rodwell Jones the scholar and the gentleman; nevertheless, the book is a pious memorial to "a loved and respected friend and teacher." E. W. G.

THE ANARCHIST PRINCE: the biography of Prince Peter Kropotkin. By GEORGE WOODCOCK and IVAN AVAKUMOVIC. *London: Boardman*, 1950. $8\frac{1}{2} \times 5$ *inches;* 463 *pages; end-paper map and illustrations.* 21*s*

Prince Kropotkin, in his capacity as an explorer-geographer, was connected with our Society for a number of years. As his biographers show, his life may be divided into three periods; before 1872 he had made several important journeys in Eastern Siberia and in Finland; from 1872 to 1886 he was an anarchist agitator and conspirator, and from the latter date until his death in 1921, he may be described as a retired theorist and libertarian. As a result of his Siberian journeys, he did much to bring order into the confused notions of the topography of northern Asia, showing that the general alignment of the mountain ranges was from north-east to south-west. His results were published

by the Imperial Geographical Society, and he presented reprints to our Society in 1873. About this time Kropotkin began his political activities, for which he was arrested the following year. After two years' imprisonment he made a dramatic escape, and finally reached England where he earned a living for a time as a reviewer of scientific books. He thus came to know John Scott Keltie, then assistant editor of *Nature*, who became his closest scientific friend in England. On one of his visits to France he was thrown into prison during an anarchist scare, and while in prison he contributed an article to the *Nineteenth Century* (December 1885) on "What geography ought to be." This was in part a review of Keltie's 'Geographical education: Report to the Council of the R.G.S.' At this time also he was contributing to the 'Géographie Universelle' of Elise Reclus, who shared his political views. It was probably through Keltie that Kropotkin came to meet H. W. Bates, then Secretary of the R.G.S. and one of the first to encourage Kropotkin in his study of the role of mutual aid in human and animal life as a factor in evolution—a counter to the extreme Darwinians. When Keltie succeeded Bates as Secretary, in 1892, Kropotkin became a fairly regular contributor to the *Geographical Journal*, supplying reviews and notes on foreign geographical work. His most important contribution was however a revision of his two papers on Asian orography, published in 1904, with two folding orographical maps in colour. His life is related in great detail in this volume; the general reader will probably find the political disquisitions rather overwhelming, but a portrait of the man does emerge. Dr. Mill remembered him as a mild-mannered man, and Keltie writes of "his warm but perhaps too tender heart." Yet throughout all his vicissitudes of fortune, of which ill health was not the least, he stuck staunchly to his principles. G. R. C.

THE USE OF GEOGRAPHY. By F. DEBENHAM. (Teach yourself geography series.) *London: English Universities Press*, 1950. $7\frac{1}{2} \times 5$ *inches; 206 pages. 6s*

This book is an introduction to a series of volumes called "Teach yourself geography," each of which has been or is being written by a member of the staff of the Cambridge School of Geography of which Professor Debenham was the first head.

The author's chief aim is to show that geography is a practical subject and one that is full of interest. It is defined as the philosophy of place, with a discipline of its own, and Professor Debenham rejects the assumption that it is merely a collection of facts from many branches of knowledge without any clear boundaries.

The greater part of the book is occupied by readable and interesting accounts of geography, from various points of view—the history of the subject, geography from the arm-chair, geography in the field, the physical background, human geography, and geographers at work. All these accounts give the impression that Professor Debenham delighted in writing them and this delight cannot fail to be passed on to his readers. He does not develop the philosophy of the subject but the book does demonstrate, as is indeed its main purpose, the use of geography in practical fashion and it should be read by all geographers. L. B.

THE SOCIETY'S NEWS

MEDALS AND AWARDS, 1951

His Majesty the King has approved the award of the Royal Medals as follows: *The Founder's Medal* to Dr. V. E. Fuchs, Principal Scientific Officer, Falkland Islands Dependencies Survey's Scientific Bureau, Colonial Office, for his contributions to Antarctic exploration and research as leader of the Survey, 1948–50; *The Patron's Medal* to Dr. Donald Thomson, Research Fellow, Melbourne University, for geographical exploration and studies in Arnhem Land. The Council have awarded *The Victoria Medal* to Dr. C. A. Cotton, Professor of Geology, Victoria University College, New Zealand, for his contributions to the geomorphology of New Zealand; *The Murchison Grant* to Dr. George Salt, Fellow of King's College, Cambridge, for geographical studies of the Shira Plateau of Kilimanjaro; *The Back Grant* to Mr. J. N. Jennings, lecturer in Geography, University College, Leicester, for his work on the origins of the Broads; *The Cuthbert Peek Grant* to Mr. W. B. Harland, Lecturer in Geology, University of Cambridge, for surveys and mapping in central West Spitsbergen; *The Gill Memorial* to Dr. W. R. Mead, Lecturer in Geography, University College, London, for geographical research in Finland.

THE NORWEGIAN-BRITISH-SWEDISH ANTARCTIC EXPEDITION

The *Norsel* was this year able to remain at Maudheim, the expedition's base, from January 6 to 20. During this short period the weather was most unfavourable for air photography and the results of this part of the work have so far been disappointing. New mountains were sighted from the air to the south and south-west of Kraulfjella (the German "Kraul-Berge"), which was the farthest inland reached in February last year by the R.A.F. West of these new mountains a deep bay stretching south-eastwards into the shelf ice appears to exist near the boundary between Queen Maud Land and the Falkland Islands Dependencies. Photographs have been taken of these features, but it will probably not be possible to plot their positions accurately on maps until sledging parties can provide the necessary ground control, or further investigation from the air can be carried out.

At the time of *Norsel's* visit only seven men were at the base and the sledging parties were just starting their summer programme of exploration in the western part of the main mountain range discovered by the German expedition in 1939. They have been working from an Advance Base, with a large provision depot, which was established during the spring 185 miles south-east of Maudheim, in lat. 72° 16′ S., long. 3° 49′ W. The last sledging party is not expected to return to Maudheim until May, but it is already clear from the preliminary reports received that the season's survey, geological and glaciological work in this area has been highly successful.

Meanwhile, a tragic accident has occurred at Maudheim. On February 23 three members of the expedition lost their lives when a weasel (snow tractor) fell from the ice edge into the sea. They were John Jelbart, of Australia, Corporal Leslie Quar, of the R.A.F., and Bertil Ekström, from Sweden. Stig Hallgren, the fourth member of the party, was unhurt. He managed to swim to an icefloe from which he was rescued by boat 13 hours later. This tragedy must seriously affect the future work of the expedition. The loss is not only a great personal

blow, but also deprives the expedition of an expert physicist, radio technician and mechanic, whose abilities were very highly valued.

GRANTS TO EXPEDITIONS, 1951

The Council has approved grants to sixteen expeditions in 1951. Of these a number are led by undergraduates from the Universities; Birmingham University expedition to Spitsbergen led by E. R. Hitchcock, which will do geological and topographical mapping, receives £50; Durham University Exploration Society expedition, under R. A. Young, £50 for mapping, ecological and ornithological work in Iceland; Oxford University Exploration Club £20 for its expedition to the Kiunga Archipelago to be led by Thomas Huxley; and the newly formed University College, London, Exploration Society £40 for an expedition to the Azores Islands, led by Bernard Stonehouse, which includes a land utilization survey in its programme. Expeditions under leaders with considerable field experience which have also received grants are a survey expedition to South Georgia led by Duncan Carse, £100; an archaeological expedition to Cyrenaica under Richard Goodchild, Deputy Director of the British School at Rome, £50; a geological expedition to Spitsbergen led by W. B. Harland, lecturer in geology, Cambridge University, and J. M. Hartog, £50; an expedition to Queen Louise Land by Commander C. J. W. Simpson to prepare the way for a major expedition in 1952, £50; and a geological expedition to Mount Ruwenzori led by Professor W. G. Kennedy, F.R.S., Professor of Geology in the University of Leeds, £100. Individual graduates engaged on specific research problems have received the following grants; D. J. Atkinson, for geological work in West Spitsbergen, £40; W. G. V. Balchin, Lecturer at King's College, London, for a study of landscape evolution and irrigation systems in the Sonora and Mohave Deserts, U.S.A., £20; B. H. Farmer, Fellow of St. John's College, Cambridge, for an investigation of settlements schemes in Ceylon, £30; Miss M. Findlay for sociological and anthropological work in West Greenland, £50; J. M. Houston, Lecturer at the School of Geography, Oxford, for an irrigation study in Spanish Morocco, £20; and Dr. Marjorie Sweeting, Fellow of Newnham College, Cambridge, for work on the physiography of limestone areas in Yugoslavia, £30.

GEOGRAPHICAL ESSAY PRIZE

The Council, on the advice of the examiners, have decided not to award the Geographical Essay prize this year to any of the entries. The prize of £10 is offered each year for either a critical survey of recent additions of knowledge in a limited geographical field or a discussion of some current problem in its geographical aspects. Candidates must be registered students reading geography at a university of Great Britain or Northern Ireland during the academic year in which they submit the essay. Essays submitted for the next award must reach the Director and Secretary by 15 January 1952. The Council reserves the right to publish or to retain for the Library any of the essays submitted for this prize.

NOTE ON "ADDITIONS TO THE LIBRARY AND MAP ROOM"

The Council have decided to resume the separate publication of the lists of literature and maps which was suspended during the war. It is proposed for the present to publish two lists a year, the first appearing in June. The subscription for 1951 has been fixed at 7*s* 6*d* post free, and all orders should be sent to the Office of the Society, Kensington Gore, S.W.7. A less comprehensive list of Additions will continue to appear in the *Journal*, but must be omitted from this number while the change is effected.

AN EXHIBITION AT THE SOCIETY'S HOUSE

In connection with the Festival of Britain, the Society and the Institute of Navigation have arranged an exhibition of "British Maps and Charts" in the Ambulatory, with the cooperation of the Hydrographic Department, the Ordnance Survey and the Ministry of Civil Aviation.

The main object is to show developments in the last fifty years, but there is also a small historical section which includes the Molyneaux terrestrial globe of 1592, the first globe made in England and the first by an Englishman. This is exhibited through the kindness of its owner, Lord Leconfield. The Hydrographic section illustrates a recent *radar* survey of the Channel, changes in style in the Admiralty charts and changes in methods of reproduction. The Ordnance Survey exhibits are arranged to illustrate briefly methods of triangulation and the revision of large-scale plans. A number of the Ten-Miles-to-One-Inch maps, prepared for the Ministry of Town and Country Planning, and various types of maps for air navigation are displayed.

The exhibition is open to the public from 10 a.m. to 5 p.m.

RETIREMENT OF MR. G. MACKAY

At the end of May, Mr. G. Mackay, chief assistant in the Map Room, retired after 48 years' service on the Society's staff, broken only by military service in the 1914–18 war. He is one of the few remaining links with the presidency of Sir Clements Markham and the Society's quarters in 1, Savile Row. Mr. Mackay has a comprehensive and thorough knowledge of the contents of the Society's map collection, and his ability to produce the best map for a particular purpose will be greatly missed. He carries with him the best wishes of the Council and of his colleagues in his retirement.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

M. W. Beresford is lecturer in economic history, University of Leeds. His main interest is the economic history of the English landscape, rural and urban, and he has specialized in the application of air photographs to historical research. *George Salt*, Fellow of King's College, Cambridge, and University lecturer in Zoology, has studied animal life at high altitudes. *B. L. C. Johnson* graduated from the Joint School of Geography at King's College and London School of Economics in 1947, and is now a lecturer in geography at the University of Birmingham. *Norman Pye* is lecturer in geography at Manchester University. He was seconded to the Admiralty for war service, and is the author of the recently published Professional Paper on selected manuscript documents of historic importance preserved in the Hydrographic Department. *W. G. Beasley* is lecturer in the History of the Far East at the School of Oriental and African Studies, London University. *C. C. Doncaster* is Scientific Officer, Rothampstead Experimental Station; *W. R. Philipson* is Principal Scientific Officer, Department of Botany, British Museum (Natural History), and *J. M. Idrobo* is Professor of Botany, National University of Colombia, Bogatá, at present carrying out research at the National Herbarium, Washington, D.C. *C. T. Smith* graduated in geography at Cambridge in 1946, and is now assistant

lecturer in geography, University College, Leicester. *R. J. Cyriax*, who has made a detailed study of Arctic exploration, and particularly of the Franklin Expedition, is the author of 'Sir John Franklin's last Arctic expedition.' *F. V. Botley* is a West London schoolmaster who is engaged in research on modern cartography. *R. J. Harrison Church* is lecturer in geography at the London School of Economics. *R. A. Skelton* is Superintendent of the Map Room, British Museum, and Hon. Secretary of the Hakluyt Society. *A. L. A. Caesar* is assistant lecturer in the Department of Geography, Cambridge University.

INTERNATIONAL CONGRESS OF COLUMBUS STUDIES, GENOA

From March 15–17 a "Convengo internazionale di Studi Colombiani" was held at Genoa, as part of the celebrations, extending over a year, by which the five hundredth anniversary of Columbus' birth is being commemorated in his native city. The Italian and foreign representatives, from more than fifteen countries, who took part were the guests of the City of Genoa. At a preliminary session, Professor Paolo Revelli was elected President, and Professor Guiseppe Rosso, Secretary-General. The Congress was organized in three sections which met in the University; the first dealt with the life, practical experience and culture of Columbus; the second with the cultural and economic movements of his time, and the third with later progress in the discovery of America. The feeling of the Congress was that future studies should be concerned less with hypotheses regarding Columbus' origin and career, sometimes almost pure phantasies, and more with examining the technical equipment which enabled the discoveries to be made. It was hoped that an appropriate international body might be induced to sponsor the study of the corpus of contemporary scientific knowledge. A volume, 'Studies on Columbus,' to be published this year, will contain the communications read to the sections. In addition to the ordinary sessions, there were evening lectures by foreign scholars on various aspects of Columbus' life and work. A special word must be said of the Columbus Exhibition at the Palazzo San Giorgio, where an extensive collection of documents, maps, pictures and relics had been assembled. For the student of historical cartography it was an unrivalled opportunity to study fourteenth and fifteenth century charts ordinarily dispersed in many libraries. On March 17, in the presence of the President of the Italian Republic, who was paying his first official visit to Genoa, the foundation by the city of a "Civico Instituto Colombiano" was announced. All the documentary material relating to the discoveries will be assembled in a properly designed building, and facilities and studentships for research will be provided. The British representatives were Mr. G. R. Crone (R.G.S.), Mr. R. A. Skelton (British Museum), and Professor Arthur Davies (University College, Exeter). All those present will wish to thank sincerely the Sindaco di Genova, Professor Gelasio Adamoli, for the generous hospitality offered, and to congratulate Professor Revelli on the success of the meeting, largely due to his energy, humour and eloquence. G. R. C.

JUBILEE CELEBRATIONS OF THE ROYAL GEOGRAPHICAL SOCIETY OF EGYPT

The Royal Geographical Society of Egypt celebrated its Diamond Jubilee from 27 December to 3 January of this year in Cairo. Other ceremonies, held simultaneously, commemorated the Silver Jubilee of Fouad I University and the inauguration of Fouad I Desert Institute.

The Director and Secretary represented the Society, on the invitation of the Egyptian Government, and conveyed the Society's congratulations in a brief address at the opening Jubilee meeting which was honoured by the presence of

H.M. King Farouk, the Prime Minister Nahas Pasha and other members of the Egyptian Government. Addresses were also given by Professor Cressey, representing the International Geographical Union, and by Dr. Kimble, on behalf of the American Geographical Society. Two afternoons were devoted to scientific papers.

The very generous hospitality arrangements of the Egyptian Government included visits to many places of interest in and around Cairo. The coordination of the arrangements for the geograpical delegates was in the excellent hands of Dr. Hassan Awad, Secretary of the Egyptian Society, who received much well deserved congratulation.

INTERNATIONAL GEOGRAPHICAL CONGRESS, WASHINGTON, AUGUST 1952

Those requiring information about arrangements for attendance at the Congress, presentation of papers, travel facilities, etc., should apply as soon as possible to the Assistant Secretary, Royal Society, Burlington House, London, W.1.

A CONFERENCE ON MARINE METEOROLOGY

A conference on marine meteorology is being organized by the Geophysical Institute of the University of Genoa from 20 to 22 September 1951 to coincide with the Columbus Celebrations to be held in Genoa this year. The meeting is concerned with meteorological problems relating to navigation, with particular reference to the Mediterranean, and the principal topics will be the vertical distribution of humidity, visibility and the genesis of fog, and the influence of wind on wave motion.

Requests to attend the conference should be addressed to the Instituto Geofisico e Geodetico dell'Universita, via Balbi 5, Genoa, and should be accompanied by a remittance of 3500 lire (about £2). A reference should be made to the Institute's circular of 20 March.

COURSE IN PHOTOGRAMMETRY

The Swiss Federal Institute of Technology is holding a nine weeks' course in photogrammetry from 20 August to 20 October 1951. The course, which will be conducted by Professor M. Zeller, will include instruction in photogrammetrical method and practical training. Further information may be obtained from the Director, Institute of Photogrammetry, Swiss Federal Institute of Technology, Zurich.

UNIVERSITY NEWS

APPOINTMENTS

The following appointments have recently been announced. Mr. Wilfred Smith, formerly lecturer in the Department, to be Rankin Professor of Geography in the University of Liverpool: Dr. O. H. K. Spate, Reader in Geography at the London School of Economics to the Chair of Geography in the Australian National University, Canberra: and Mr. R. F. Peel, Lecturer in the Department of Geography, University of Cambridge, to the second Chair of Geography in the University of Leeds. Mr. W. B. Fisher, of the Department of Geography, University of Aberdeen, has been appointed a Senior Research Fellow of the Carnegie Endowment of Scotland, and is spending six months in the Middle East.

REPORT OF THE SCHUSTER COMMITTEE ON QUALIFICATIONS OF PLANNERS. (CMD. 8059)

A committee, with Sir George Schuster as chairman, was appointed in 1948 by the Minister of Town and Country Planning and the Secretary of State for Scotland, to consider the qualifications necessary or desirable for persons engaged in town and country planning; the committee's Report was published at the end of 1950. This document gives a brief history of planning, an account of the present scope and objectives of town and country planning, a summary of the posts to be filled and the existing arrangements for obtaining qualifications, a résumé of the evidence submitted and, finally, the considered recommendations of the committee.

The Report is of great interest to all geographers and especially to the Society which itself sent a memorandum of evidence to the committee. This memorandum, which insisted that all planners should receive training in certain aspects of geography, is quoted in the Report, as is the evidence submitted by Professors E. G. R. Taylor, S. W. Wooldridge, L. Dudley Stamp and G. H. J. Daysh. It is satisfactory to record the fact, obvious from a reading of the Report, that considerable weight was given to the evidence provided by geographers.

Most of those submitting evidence argued that the preliminary training of planners should be as broad as possible and several witnesses named the Oxford Greats school, the philosophy-politics-and-economics school, and arts degrees in history, or geography, or economics as each providing a suitable grounding of general value for prospective planners. The number of witnesses who included an honours degree in geography as one possible course for training planners is a remarkable tribute to the recent academic progress of the subject. The Report itself includes geography as one of the basic disciplines of a graduate who wishes to engage in planning (p. 54).

The Universities of Durham and Manchester have both introduced five-year courses for B.A. honours degrees in town and country planning. But the Report contains a strong preponderance of evidence from other universities against setting up town and country planning as a first degree course. Oxford considers that "town and country planning is a suitable subject for university education but should be dealt with not as a first degree course but as the subject of a post-graduate diploma," and that at Oxford a suitable preliminary to such a diploma course would be on the lines of the schools of philosophy-politics-and-economics or geography. This view was expressed in a more or less similar form by the Universities of London, Liverpool, Nottingham, Reading and Sheffield. Cambridge University "alone of those submitting evidence came down flatly against any university participation in the training of town and country planners either by a full-time degree course or by post-graduate study."

The committee decided that a national institution is needed to encourage experiments in the technique of planning and to evolve an effective system of granting recognition to persons of proved ability in planning. The committee believed that the Town Planning Institute, if its membership was substantially widened, would be the obvious foundation on which to build, but considerable changes in its constitution were considered an essential. The committee also pleaded for a wider basis of recruitment to the planning profession. They suggested that it is not essential for a chief planning officer to possess a technical qualification in architecture, engineering or surveying. It is not known if these proposals will be acceptable to the professional bodies concerned, but they have given much encouragement to the many geographers now actively engaged in

planning as officers of the Ministry of Town and Country Planning or on the staffs of local authorities. But it is certain that the Royal Geographical Society will welcome the general recognition now given to geography in the training of those seeking professional qualifications as planners. This recognition, in an official document, of the improved status of geography is bound to have a further beneficial effect by making other careers more open to geographers than before. E. W. G.

INSTRUCTIONS FOR A SIXTEENTH-CENTURY COLONIAL SURVEYOR

Professor D. B. Quinn while working on Sir Humfrey Gilbert's proposed expedition of 1582 to North America has discovered in the British Museum, among the Hoby papers, copies of the instructions drawn up for the surveyor, Thomas Bavin. These are of exceptional interest for the history of British cartography and, at Professor Quinn's suggestion, Professor E. G. R. Taylor has published a commentary upon them in the *Mariner's Mirror*, January 1951, well illustrated with photographs of contemporary instruments. Bavin was to chart the coast line from Florida to Cape Breton; but when the expedition finally sailed in 1583, he can only have carried out some surveys around St. John's, Newfoundland, before he was lost in the *Admiral*. Professor Taylor describes concisely the development of navigation and chart making in England during the sixteenth century, emphasizing the practical seaman's deep distrust of instrumental navigation, and the parts played by John Dee, Sebastian Cabot, Stephen and William Borough, Richard Chancellor and others in overcoming this distrust and in establishing a class of skilled navigators. She considers that Bavin's instructions were probably drawn up by William Borough, whose 'Variation of the compass' had appeared the year before. Bavin was expected to produce a large number of rough field sheets, from which a map could be prepared on his return, and he was instructed to letter (not number) these so that they might be put together easily. He was also given a characteristic sheet of conventional symbols: hills were to be shown in the style of "mounds" with marks to show their vegetation; forest areas were to be shaded and the type of tree noted. He was also to observe the compass variation frequently, recording the latitude and longitude of the observation points. Among the instruments to be provided for him were a universal dial, a "cross staffe," "sayling compasse," three "flate watch-clockes," and instruments for determining magnetic dip and variation. It was hoped that with the watches Bavin would be able at least to determine differences in longitude, and perhaps, with the aid of an eclipse, an absolute value in relation to London. He was certainly expected to carry out a great deal of work, practically single handed; his instructions may perhaps be taken as evidence that his contemporaries realized the standard which good survey should reach, though their practice might lag behind. Almost contemporaneously, Christopher Saxton was mapping the counties of England and Wales, but even on land and in his own country, his work was not as comprehensive as the standard laid down for Bavin—though this may have been partly because Saxton was by origin an estate surveyor. G. R. C.

THE CLIMATE AND WEATHER OF NEW ZEALAND

The New Zealand Geographical Society announces the inauguration of two new series of special publications, a *Miscellaneous Series* and a *Research Series*. The first of the former series, recently published, is a summary of New Zealand meteorology and climatology.[1] It includes an account by N. G. Robertson of

[1] 'New Zealand weather and climate.' Edited by B. J. Garnier. (*Special publications of the New Zealand Geographical Society, Miscellaneous Series*, no. 1), Auckland, 1950.

the organization and development of the weather observatories in the Dominion; a paper on the principles of weather forecasting, by J. E. M. Watts; a reprinted paper on the elements of the New Zealand climate, by the late Dr. E. Kidson (whose death in 1939 was a great loss to meteorology); and lastly two chapters by the editor of the publication, B. J. Garnier. Garnier deals with the complex local variations of climate, using Thornthwaite's classification which is so serviceable for agricultural purposes. In this scheme, indices of temperature effectiveness involve certain temperature ranges, and indices of precipitation efficiency evaluate the rainfall with reference to temperature.

In the absence of disturbing land masses, New Zealand weather is governed by a fairly regular and almost wave-like sequence of anticyclones and depressions and forecasting would be relatively simple if it were not for the high relief, the deep inter-montane basins and the narrow water channels which canalize the air currents. The mean annual temperature decreases steadily from 60° F. in North Auckland to 50° F. in Otago, and it is interesting to note that a mean not lower than 56° is ordinarily required for the successful cultivation of oranges, grapes and maize. The generally rather small range between winter and summer increases in the more "continental" provinces of Canterbury and Otago and, under standard conditions of exposure, the thermometer has risen as high as 100° at Christchurch and fallen as low as −4° at Ophir, Otago. In this region moreover, there are sudden changes of temperature when hot north-westerly föhn winds from the New Zealand Alps give way to cold southerly "bursters." For an insular climate the difference between day and night temperatures is high, a fact attributable to the clear air and abundant sunshine. Though night frosts occur everywhere in winter the general mass of air over the country is never below freezing so that, except in the mountains and locally in the extreme south, spells of continuous day and night frost are unknown. The distribution of rainfall is closely governed, as in the British Isles but in a more accentuated manner, by relief. In South Island there are large tracts with an annual rainfall of over 100 and even 200 inches on the windward slopes of the Alps, set off on the rainshadow side by considerable areas with less than 20 or even 15 inches. This excessive precipitation in the west brings the snow-line below 7000 feet and the Franz Josef and Fox glaciers descent almost to sea-level. Snow is stated to interfere occasionally with railway traffic on the central plateau of North Island, and in some years to cause a serious loss of sheep and cattle through heavy drifting in the Alp foothills of Otago.

The climate of New Zealand is represented as conducive to wind resistant and evergreen types of vegetation and only in the south is there any period of winter rest. It would be extremely interesting to know whether any of the deciduous forest trees of English origin which may be maintaining their status in Canterbury are tending to become evergreen in Auckland. L. C. W. B.

GULF STREAM NAVIGATION

The Sperry Gyroscope Co. recently began an investigation of the current variations within the Gulf Stream. Preliminary results obtained by their motor vessel *Wanderer* suggested that a vessel sailing on the charted axis of the stream could expect to gain a full knot compared with a course 3 miles to either side of the axis. Early in 1950 an extended investigation was begun under the auspices of the Hydrographic Office and the U.S. Coast and Geodetic Survey. It is planned that seven or eight vessels on the Gulf route shall sail on selected routes along the axis of the stream and on either side of the axis, and it is hoped that it will then be possible to determine the position and strength of any high

velocity section within the Gulf Stream. The Survey hopes also to ascertain any seasonal or periodic variations of the axis. Eventually it may be possible to select sailing routes which will give a saving in both time and fuel.

The Woods Hole Oceanographic Institution has recently been working in the area of the Gulf Stream north-east of Cape Hatteras. Current velocities of 4 to 5 knots were found in a narrow band 10 to 15 miles wide on the left-hand edge of the stream, which is subject to a shift of as much as 10 miles in a week. Observations show that the highest velocities north of Cape Hatteras exceed most previous estimates. Strong eddies have been found to the north and south of the stream; these are not usually reflected in the day's run because for each current in one direction there is usually an opposite one of nearly equal velocity. From the studies of the Woods Hole group it is evident that the mean position of the Gulf Stream as shown on the Coast and Geodetic Survey and Hydrographic Office Charts has little useful meaning in the area to the east of Cape Hatteras.

A NEW TOPOGRAPHICAL MAP ON THE SCALE OF 1/1M

During the war, the Directorate of Military Survey produced a map on the scale of 1/1M in the style known as "Army/Air." Now that air navigators are adequately provided with specially designed maps by the International Civil Aviation Organisation, it has been possible to re-design this Million series for ground use only. We have received from the Director of Military Survey the first two sheets of the 1/1M World Topographical Map, with notes on the design. The sheets, chosen as representing areas of widely differing topographical character, are "NL–32 & east/half31: Milano" and "NH–36: Cairo." The sheet lines of the International Million Map have been retained.

The principal aim of the map is to show as much topography and as many names as is practicable on this scale. There has been little generalization of the contour lines, and these, in conjunction with the layer colouring—at 100, 200, 500 metres and thence by 500 metres to 4000 metres—give a good representation of relief. On the Milan sheet the layer colours range from a pale yellow to a dark grey, with white for glaciers and permanent snow. There are also numerous spot heights in brown, and the summits of passes are marked and their heights indicated. Railways are in brown and roads, classified, in red. To keep the map as clear as possible, the names of countries appear only in a small index map of boundaries, and no administrative divisions are named; it might be useful if, for example, the French Départments were also shown in this index. The graticule is also printed in brown to avoid rendering illegible the names crossed by it. An unusually large number of names have been included, and though some are naturally small, they are legible and do not obscure other details. The numerous names of physical features are useful, as is the index printed on the back which for the Milan sheet includes more than 4000 names. The Cairo sheet shows that the design is equally well adapted to areas of low relief. The map as a whole certainly achieves a high standard of legibility combined with a large amount of detail; it is the more to be regretted therefore that progress with the series will be "very gradual" only.

MOUNTAIN EXPLORATION

We have received from the publishers the fifth volume of 'Berge der Welt,' edited by Marcel Kurz, and published by the Swiss Foundation for Alpine Research (Bern, 1950). This volume deals with expeditions to the Himalaya, the Andes, and New Zealand. The most detailed article is an account by E. Wyss-Dunant of the Swiss Himalaya Expedition of 1949, during the course

of which several ascents were made in the Kangchenjunga area, including Pyramid Peak (7123 metres). The writer deals particularly with physiology and diet at high altitudes. The publication is also concerned with the history of mountaineering, and there are two useful articles on this theme: H. E. L. Porter on the Southern Alps of New Zealand, 1930–48, and Marcel Kurz on the Himalayan expeditions from 1939 to 1946, followed by a chronological table of Himalayan expeditions from 1818. Among the notes on current expeditions is a summary of recent Russian work in the Caucasus, Pamirs, and Tien Shan. This useful record is attractively produced, with a number of excellent mountain photographs.

ARCTIC INSTITUTE RESEARCH GRANTS

The Arctic Institute of North America is offering a number of research grants in 1952 for scientific investigations dealing with the arctic and subarctic regions. Research must include either field investigations in North America, or studies at one of the Institute offices. Application forms, which must be returned by 1 November 1951, may be obtained from the Research Committee, Arctic Institute of North America, Broadway at 156th Street, New York, 32, or 3485, University Street, Montreal.

ENGLISH PUBLISHERS OF BOOKS RECENTLY REVIEWED

We are asked to say that 'Webster's Geographical Dictionary,' reviewed in the *Journal* for June 1950, is published in Great Britain by G. Bell & Son, at a price of 80*s*.

'The invasion of New Zealand by peoples, plants and animals' by A. H. Clark, reviewed in the *Journal* for September 1950, may be obtained in this country from the Cambridge University Press; the price is 45*s*.

CORRECTION: THE SPANISH CONQUEST OF MEXICO

Mr. D. M. Poole has drawn our attention to an error which was made in editing his paper on "The Spanish Conquest of Mexico: some geographical aspects" for the March *Journal*. The statement on p. 35, "animals suitable for domestication were indeed unknown in North America," should read " animals suitable for domestication were indeed few in North America." We regret that this mistake should have escaped notice.

OBITUARY

W. H. CRACE AND J. W. THORNLEY

On 1 December 1950, two black specks were seen moving upwards at about 18,000 feet on the Rakhiot spur of Nanga Parbat. This was the last time Thornley and Crace were ever seen. The three of us were the closest of friends, and as they died together, it is perhaps fitting to write an appreciation under a joint heading.

A boyhood spent tramping the lonely Norfolk marshes was the seed from which Bill Crace's enjoyment of the open air grew into a deep love for mountains. He was educated at Oundle and in 1944 left to join the 3/8 Gurkha Rifles. On leave in Kashmir he was introduced to the hills, and a little later when he met Jim Thornley the two of them spent their spare time climbing near Quetta.

Jim had been an outstanding school-boy at both work and games. He too joined the army and was eventually posted to the 3/8 Gurkhas, where he later became Adjutant. On leave in Sikkim, he climbed alone above 22,500 feet searching for a man who had been lost some months before.

In 1947, the three of us returned to Sikkim and made an attempt on 24,000 foot Kabru. At 20,000 feet the Sherpa porter who was with us fell 70 feet into a crevasse. Jim at once climbed down after him, and Bill spent several days alone with the injured Sherpa, while we went down for help.

In July 1950, we again sailed for India with plans for spending a year surveying and exploring in the Karakoram. The Society had kindly helped us with money and instruments. After we had been in the field three weeks, the Pakistan Government withdrew the permission they had given us a short while previously when we were still in England. Rather than return home at once with everything lost, we decided to make a reconnaissance of Nanga Parbat. And it was on this mountain that my friends lost their lives.

Bill's kindness, fine courage and easy-going temperament made him an ideal travelling companion. He would happily have spent his life in exploration and there can be few people more suited both in disposition and physique for such a career.

In the mountains of Wales, Switzerland or the Himalaya, Jim was always in his element. He was ever the leader, no matter who was in the party, and he would gain that position by a combination of competence, strength of character and extraordinary powers of endurance.

They were very fine friends and it is tragic that two lives of such promise should have ended while both were in their middle twenties: but I am sure that the manner of their death they would not have changed. R. M. W. MARSH

LADISLAS ALMÁSY

The Egyptian press announces the death in Innsbruck last March of the well-known Libyan Desert explorer, L. E. Almásy.

An experienced aviator of the First World War, Almásy became fired with the idea of discovering the legendary "Oasis of Zerzura" and, during the years 1931–36, made several daring expeditions with that purpose. On the first of these, while Almásy was away on a trip to Kufara, his companions, Sir Robert Clayton-East-Clayton and Wing-Commander Penderel (both now dead) first viewed from the air an acacia-dotted wadi in the Gilf Kibir which had up to then been thought utterly devoid of vegetation. On his next excursion Almásy visited this Wadi 'Abd el Malik, and two others like it, and for a time laboured to persuade an indifferent world and a sceptical Survey of Egypt that these constituted the true Zerzura, the "Oasis of the Blacks." On the same trip Almásy made a discovery of more importance, that of the rock paintings of 'Ain Dua, though his claim to priority was contested by an Italian, Professor Caporiacco. Almásy's book 'Récentes explorations dans le Désert Libyque' was reviewed in the *Journal* (89 (1937) 265–7).

On a further expedition with the late Baron von der Esch, he explored the dune country south-east of Siwa oasis in the vain hope of finding the lost army of Cambyses. On that journey he took some photographs which were later to serve (with acknowledgements) as illustrations to 'Nord Ost Afrika,' the official handbook of the Afrika Korps. During Rommel's campaign Almásy made various audacious expeditions behind our lines. On one occasion making

use of El'Aqaba, the pass through the Gilf Kebir discovered by him in 1931, he reached Kharga oasis in a captured British car, bluffed the frontier post there and, later the same day, delivered two German agents near Asyut. He, but not they, got safely back to the Afrika Korps.

The adventurous Almásy, who justly claimed to be the first European since W. E. Brown to have traversed the Darb el-Arba'in throughout its length, seemed in civilization to be rather out of his element. On his desert record and on his war record, the judgment can safely be passed: "a Nazi but a sportsman."

G. W. MURRAY

CORRESPONDENCE

HISTORICAL RECORDS OF THE SURVEY OF INDIA

Your reviewer's notice of Colonel Phillimore's 'Historical records of the Survey of India (*Geogr. J.* 117 (1951) 97) gives the impression that "Lambton began the trigonometrical Survey of India." Indeed in the same breath, almost, he refers to cessions of large portions of Hindustan to the Company, and Northern Hindustan at that.

I have before me the Survey of India's general report for 1925/26 which states, appendix (i), that Lambton died in 1823, that in 1823 the title of Surveyor-General became permanently established, and that the officer who was to organize the great framework of the Trigonometrical Survey on its present lines assumed the office of Superintendent.

Colonel Valentine Blacker is believed to have fully appreciated the value of a proper basis of triangulation of a high order of accuracy for the whole Survey of India. The authorship of a lithographed pamphlet entitled "Construction of a graticule for a general Atlas of India" is attributed to Colonel Blacker.

The Report goes on to say that Valentine Blacker had been Quartermaster General of the Army. In those days the Quartermaster General performed the functions of the present General Staff, particularly as regards reconnaissance and intelligence. Valentine Blacker was *de facto* the Chief of Staff, in present day parlance, of the Grand Army of the Deccan in the Campaign of Maheidpore, somewhat overshadowed by Waterloo.

It would appear therefore that Lambton's triangulations were conducted locally in the Carnatic, as indeed your review later on implies.

L. V. S. BLACKER

24 *March* 1951

THE SURVEY OF EGYPT

In the review of 'The Survey of Egypt, 1898–1948,' edited by G .W. Murray, (*Geogr. J.* 117 (1951) 98) it is stated that "it is incorrect to claim that General Maude's maps in Iraq, used for the advance to Baghdad in 1917, were the work of sections from the Survey of Egypt."

I should like to state that Lieut. W. M. Hayes (now Brigadier) and I were sent out to Iraq with a complete equipment for photo survey mapping and a flat bed printing machine in 1916. Very soon after our arrival at the front, Sannayat Lines, we joined up with Major Gunter, R.E., of the Survey of India. As we were far better equipped for photo survey work than he was, and had had

experience of Gallipoli, it was agreed that Lieut. Hayes and I should take over all air survey work and Major Gunter would take over our flat bed machine and be responsible for printing and distribution of the maps. This division of labour worked smoothly and well until after the capture of Baghdad. Lieut. Hayes and I were recalled to Egypt in 1917.

JAMES H. COLE

27 *March* 1951.

MEETINGS: SESSION 1950–51

Eleventh Meeting, 15 January 1951. The President in the Chair

Transferred from Associate Membership to Fellowship: Miss H. J. Byles; R. L. Bacon; Robert Clayton

Paper: The Changing English Landscape. By Professor H. C. Darby

Twelfth Meeting, 22 January 1951. Professor J. A. Steers in the Chair

Paper: The origin of the Broads. By J. N. Jennings

Thirteenth Meeting, 25 January 1951. A joint meeting with the Royal Photographic Society and the Royal Institute of Chartered Surveyors

Paper: The practical application of photogrammetric surveying. By P. G. Mott

Fourteenth Meeting, 5 February 1951

Films: Indian scenes, Kodachrome films with commentary by Colin Cleghorn

Fifteenth Meeting, 19 February 1951. The President in the Chair

Elections to Fellowship: Mrs. Mary Holland Allenby, B.SC.; Leslie J. Avery; Fred Bettess, M.ENG.; K. Peter Boulton; Mrs. Dorothy May Castle; Miss Mary P. Chanter; Aubrey Clarke, B.A.; Trevor Coombes; Miss Grace Phoebe Ransome Cooper, B.A.; Pilot Officer Colin Cusick, R.A.F., B.A.; Dr. Matthew David Da Fano; Mrs. Anne Da Fano; Alan David Victor Elliott; George Thomas Evans; Johannes deVilliers Graaff; Wilfred Dudley Green; Gilbert Hawker; Henry Hotchkiss; Dr. Richard Geddes Large; Roy B. Lodge; George Edward Robertson; Mrs. Peggy Ursula Roe; Henry George Ross; Peter Markham Scott, M.B.E., D.S.C., M.A.; S. S. Sodhi; Rev. John P. Stapleton; Herbert Van Thal; Arthur Cuthbert Watson; Bruce Bownass Whittaker; Joseph Vincent Wielding, B.A.

Transferred from Associate Membership: Miss Frieda Barnett; Miss Barbara M. Cannon; Miss P. M. Hillebrandt; Peter S. Richards; J. G. Simpson; C. B. Williamson

Elections to Associate Membership: Miss Judith E. Carr; Miss Lilian Davenport; Barry Howard Larkman

Paper: The Danish expedition to Pearyland. By Count Eigil Knuth

Sixteenth Meeting, 8 March 1951

Films for teachers of geography

Seventeenth Meeting, 12 March 1951. Professor W. Gordon East in the Chair

Paper: Finnish Karelia. By W. R. Mead

Eighteenth Meeting, 19 March 1951. The President in the Chair

Elections to Fellowship: Mutwakil A. Amin; Ampromfi Ato Bandoh; Captain Michael E. B. Banks, R.M.; William T. Barker; Dr. R. LeBaron Bowen; Dr. Ronald H. Brinkman; Bernard M. N. Brown; Thomas W. Buchanan, M.A.;

Colonel Robert Cook (rtd); J. B. Corfield; Mrs. Martin deSelincourt; John Duff; T. I. Evans, B.SC.; Captain E. B. Froggatt, R.E.M.E.; Lewis Keith Hathaway; Roger Leigh Hayes; Kenneth R. Hilditch, M.PH.S.; Squadron Leader K. H. Houghton, D.F.C., R.A.F.; Captain William B. Houston; Jack Ingram; Miss Phyllis M. Jeffrey, B.SC.; Raymond Leigh; Arthur William Lofts; Christopher G. Lovell; Norman M. Macarthur; Mrs. Stuart-Low; John S. Manaton; M. Mansell-Moullin; Charles W. Mills; Sheikh Haniff A. Mohammed; Eyo Ita Eyo Nkune; Arthur Gerald Neale; Michael O'Callaghan; William P. Packard, M.A.; Raymond E. Parkinson, B.A.; Alec. James Penketh; Samuel W. H. Ponsford; Mrs. Phyllis M. Ponsford; Rev. Clyde D. Proud; Roger A. Pyatt; John Rose; Dr. Sigmund Samuel; David A. Scogings, B.SC.; J. K. Smallcombe; Charles Warkman; John Warner; Dr. T. Myron Webb; James Mostyn Williams

Transferred from Associate Membership: John P. Cuffley; Alistair S. MacMillan; Brian James Seaton; James B. Seaton

Elections to Associate Membership: Eric C. F. Bird; H. Keith Cushing; Alistair James Dickson; J. A. Forster; Derrick Denis King; Edward Pryce Morris; Miss Jean S. Ord; Bryan R. Richmond; David Wedden

Paper: Explorations in the Nepal Himalaya. By H. W. Tilman

Nineteenth Meeting, 2 April 1951. Mr. L. P. Kirwan in the Chair

Films: Exploring Roman Cyrenaica. Kodachrome films with Commentary by A. M. Frood

Twentieth Meeting, 16 April 1951. The President in the Chair

Elections to Fellowship: Dr. Zacarias P. Carles; N. C. B. Creek; Stanlet F. St. C. Duncan; Leslie Eaton; Dr. Phyllis M. Edwards; Irfon Evans, B.SC.; S. M. Karayalar; Ernest Arnold Lister; Donald Arthur Logan; Kinney McCaughan; Neil MacLeod; J. Kenneth L. Madge; Roy E. H. Mellor, B.A.; Mrs. Murielle Owen; Eric E. Powell; William Richards; Lieutenant-Colonel H. Roteman; Richard John Taunton; John Gordon Temple; Walter Unsworth; Commander Nigel deG. Waymouth, R.N.; Rev. Robert W. Wighton

Transferred from Associate Membership: R. A. Knowles; Michael A. Morgan.

Elections to Associate Membership: Miss Beryl Ellinor; Miss Juliet M. Etherington; Miss Mary P. Harper; Jeffery D. Horsley; C. Claire Moore; Miss Heather M. Williamson

Paper: Recent economic developments in Israel. By Sir Clarmont Skrine

Twenty-first Meeting, 23 April 1951. Professor J. A. Steers in the Chair

Paper: High mountain physiography and plant geography in different climatic belts. By Professor Carl Troll

Twenty-second Meeting, 7 May 1951. The President in the Chair

Elections to Fellowship: William B. Briggs; Anthony R. Cartwright, B.A.; John C. Cowne, B.A.; William O. Douglas; Miss C. Falkenstein, M.A.; G. C. Griffith; Albert S. Hall-Johnson; Lieutenant-Colonel P. A. J. Hernu; Major George S. Hixson, B.A., TH.B.; Crawford Keeble; William Loveday; Lieutenant George L. Milne, R.N.; Squadron Leader J. L. Mitchell, M.V.O., D.F.C., R.A.F.; Eugene F. Muller, J.P.; Charles Nakbhongs; George F. Pickstone; Flight-Lieutenant H. C. Scott, R.A.F.; Sebastian F. E. Snow; Ronald Wilkins, B.SC. ; Mrs. Wendy G. Young

Transferred from Associate Membership: Brodie J. Snyder, Jnr.

Paper: The background of British colonial development. By Brigadier M. Hotine

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE, LONDON, S.W.7

FELLOWSHIP AND ASSOCIATE MEMBERSHIP

The object of the Society being the Promotion and Diffusion of Geographical Knowledge, it has always welcomed to its Fellowship those anxious to further this object by their interest and support, as well as those able to take a more active part in the work of discovery and exploration.

It is provided by Chapter III, § 1, of the Bye-Laws that a candidate for admission to the Fellowship of the Society must be proposed and seconded by Fellows. Further, that a candidate is not to be considered eligible until he has attained the age of twenty-one years, unless he holds a Commission in His Majesty's Forces or is a matriculated student of a University of the United Kingdom or the Self-Governing British Dominions. Proposal forms can be obtained on application to the Director and Secretary, who will also lend if necessary a List of Fellows.

Chapter V, § 1, of the Bye-Laws provides that—

(*a*) *Every Fellow* (*other than those elected under Chapter III*, § 6) *shall, except as provided below, be required to pay* either *on Election Five pounds as Entrance Fee and Three pounds as Annual Subscription for the current year and thereafter an Annual Subscription of Three pounds due on January* 1 *in each year ; or instead of an Entrance Fee on election an enhanced Annual Subscription of Four pounds for the current and five following years, and thereafter Three pounds ; or a single Compounding Fee of Sixty pounds.*

For Fellows who are under the age of 25 years on election the Entrance Fee shall be reduced from Five pounds to Two pounds ; or alternatively the enhanced Annual Subscription of Four pounds shall be payable for the current year and for two following years instead of for five.

Fellows who are on election the wives or husbands of Fellows shall pay no Entrance Fee.

Fellows who are on election the widows or widowers of Fellows shall pay no Entrance Fee if elected within one year of the decease of husband or wife.

(*b*) *Fellows may compound for their Annual Subscriptions at any subsequent time by a payment of £*60 (*sixty pounds*) *less £*2 (*two pounds*) *for each Annual Subscription paid in excess of five with a minimum of £*20 (*twenty pounds*) *after* 25 *payments.*

(*c*) *No Fellow shall be entitled to vote or to enjoy any privilege of the Society while in arrear.*

Chapter IIIa of the Bye-Laws, covering the terms of Associate Membership, provides that—

1. *Candidates must be not less than* 17 *and not more than* 20 *years of age. They must be recommended by a Fellow, University or School authority.*

2. *Subscription shall be £*2 *per annum without Entrance Fee.*

3. *On attaining the age of* 21 *Associate Members become eligible for Fellowship. The Entrance Fee of £*2 *shall be waived provided they have been Associate Members for* 3 *years. Otherwise Associate Membership shall cease at the age of* 21.

All subscriptions are payable in advance, on the 1st of January in each year.

The privileges of a Fellow or Associate Member include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Society's House, Library, and Map-room. Each Fellow is also entitled to receive a copy of all the Society's Periodical Publications. Associate Members have the choice of receiving either *The Geographical Journal* or *The Geographical Magazine*. Associate Members may not describe themselves as F.R.G.S. and have no vote at Annual or Special General Meetings.

A pamphlet giving a brief History of the Society, with a description of its Work and Publications, its Charter and Bye-Laws, and an illustrated account of its House in Kensington Gore, can be sent to anyone interested on application to the Director and Secretary.

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